

DOMINANCE ANALYSIS OF OPPOSITIONAL-DEFIANT PARENT-CHILD
DYADS IN PARENT-CHILD INTERACTION THERAPY

By

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The process of social leading and following has been considered important to the effectiveness of Parent-Child Interaction Therapy (PCIT), even though this process has not been measured directly and this assumption untested. Subjects in this study were 12 oppositional-defiant mother-child dyads and 12 non-referred mother-child dyads. Each clinic dyad was observed before and after treatment, and each non-referred dyad was observed at comparable times, in two successive five-min clinical play situations in which the mother was instructed to either lead or follow the child's play. Dominance was defined as the amount of sequential patterning between mother and child leading and following behaviors. An observational measure of dominance, obtained by continuously coding changes in mother and child play

activity and speech, was developed and evaluated. Results for the children suggested that child following is an important component of PCIT, and that in CDI at post-treatment the clinic children's behavior was more self-directed than in CDI at pre-treatment. The dominance measure was sensitive to treatment changes in CDI. Inter-observer reliability was adequate for the child data. The concurrent validity of the dominance measure, with a parent-report measure of conduct problem behaviors, was established. Correlations between the dominance measure and subjective ratings of leading and following did not yield evidence of convergent validity. The discriminant validity of the dominance measure was also established.

CHAPTER I

LITERATURE REVIEW

Introduction

Children with conduct problem behaviors are distinguished from other children by their behaviors during social interaction with their parents. Children with conduct problem behaviors display higher rates of noncompliance and deviant behaviors, including whining and yelling, than non-referred children (Robinson & Eyberg, 1981). Parents of these children experience more parental and extrafamilial distress and marital dysfunction than parents of nonreferred children (see McMahon & Wells, 1989 for a review). These child and family problems are especially important considering that conduct problem behaviors are the most common psychological disturbances of childhood (Quay, 1986).

To this point behavioral clinical interventions for children with conduct disorders have involved parent-training programs based on operant behavior management principles, relationship enhancement approaches, or both.

In the late 1960s Hanf advanced a two-stage model that taught parents to use operant principles to modify child noncompliance (Hanf, 1969). In the first stage parents were

taught to follow the child's play using techniques of differential social attention. The second stage involved instructing the mother to both lead play and to respond contingently to child noncompliance or compliance with time-out or labeled praise, respectively. The purpose of Hanf's two-stage model and its subsequent modifications (Barkley, 1987; Eyberg, 1979; Forehand & McMahon, 1981) has been to improve the quality of the parent-child relationship and to more effectively manage the child's behavior.

Parent-Child Interaction Therapy (PCIT)

Parent-Child Interaction Therapy (PCIT) (Eyberg, 1979) extends Hanf's (1969) two-stage model. PCIT has proven effective in treating conduct disordered dyads. PCIT, however, is designed for a broad range of psychological disturbances in preschool children (Eyberg & Boggs, 1988). PCIT has two phases: Child-Directed Interaction (CDI) and Parent-Directed Interaction (PDI).

CDI focuses mainly on changing the quality of the parent-child relationship through enhanced communication using techniques derived from child-centered play therapy. In CDI parents are taught to follow the child in play using both nondirective interaction skills and differential social attention. Specifically, the parent follows the child by describing, praising, or imitating appropriate child behaviors, reflecting appropriate child verbalizations, and consistently ignoring inappropriate child behaviors.

Problem solving skills training for the parent has been incorporated in the second phase, Parent-Directed Interaction (PDI). In PDI the parent is taught to lead play through the use of both effective commands and positive or negative consequences contingent on child compliance or noncompliance, respectively. Specifically, the parent leads the child in play by giving effective commands and providing positive (i.e., labeled praise) and negative consequences (i.e., time-out) contingent on the child's obedience or disobedience, respectively. In practice, however, PDI is not the opposite of CDI. This is because PDI skills are actually practiced and conducted within the context of CDI. Hence, during PDI the parent and the child often exchange the lead back and forth. This would be indicated, for instance, by the child complying to a parental command (an instance of parent lead, child follow) and then the parent describing and praising the child's play (an instance of child lead, parent follow).

By blending both CDI and PDI interactive skills the parent achieves a healthy balance between being nurturant and being firm by setting clear limits and consistently enforcing them. In addition to increasing child compliance, clinical observations suggest that the parent models and facilitates reciprocal play, sharing, and social leading and following behavior.

PCIT Research into Leading and Following

As is evident from the discussion above, the ability to lead and follow are considered important to the success of

PCIT. Parent-Child Interaction Therapy research has attempted to measure leading and following by using frequency counts of particular parent verbalizations and child behaviors. For instance, a parent-child compliance interaction, by definition, provides important information on the outcome of a particular lead-follow event; the parent attempts to lead by giving the child a command and the child has an opportunity to follow the parent by complying with the request.

PCIT research using frequency counts of mother and child behaviors during their dyadic interactions has demonstrated that parents of conduct problem children have difficulty following their children in play as indicated by using higher rates of commands (Aragona & Eyberg, 1981; Robinson & Eyberg, 1981), questions and critical statements (Robinson & Eyberg, 1981), and by using less praise and offering fewer descriptions (Aragona & Eyberg, 1981) than parents of nonreferred children. Similarly, Eyberg and Robinson's (1981) results suggest that conduct problem children have difficulty following their parent's directions as indicated by their high rate of non-compliance and deviant behaviors. These studies demonstrate how frequency counts of specific parent behaviors provide a general measure of how many times the parent attempts to lead or follow the child's behavior during their play interaction. One limitation of frequency count measures of the parent-child interaction is that they do not assess how the parent and child interact with each

other contingently on a moment-to-moment basis. Stated another way, frequency measures do not assess the process of how the parent and child sequence their behaviors on a moment-to-moment basis.¹ The task of determining who is leading and who is following is complicated by the continuous nature of the parent-child interaction in which any behavior is both an antecedent to future behaviors and a consequent of prior behaviors. Thus, without knowing the sequential relationship between the parent and child behaviors it is difficult to know who is leading and who is following, and to what degree. For these reasons frequency counts are considered inadequate for describing social interaction processes in general (see for example, Gottman, 1979; Gottman & Ringland, 1981) or the parent-child system in particular (Sheeber, Wruble, Sorensen, & Eyberg, 1990).

More direct measures of parent-child interaction are provided by a time-based sequential view of how the parent and child relate to each other through time. By this account PCIT research has provided limited study of the process of leading and following. As a result there has been no evaluation of the ability of a process measure of leading and following to discriminate clinic from nonclinic dyadic interactions, or to assess the importance of leading and following to the PCIT program. This leaves researchers and

¹ The distinction being made here is the familiar one between content and process. PCIT research using frequency counts is to content as PCIT research using sequence measures is to process.

clinicians in the position of coaching the parent in specific leading and following skills (e.g., reflections, praise) without empirical support for the importance of the leading and following process. Consequently, the relationship between specific leading and following skills and the process of leading and following is unknown, making it difficult for PCIT clinicians to assess adequately changes in this process over the course of treatment.

Gottman's (1979) investigations of marital interaction illustrate the limitations of using frequency counts to study social interactions. He used highly detailed coding of distressed and nondistressed couples' nonverbal behavior while they discussed a number of decision-making issues varying from a nonconflict to a high-conflict task. He reported that distressed and nondistressed couples did not differ significantly in the amount of positive or negative affect but that distressed couples were distinguished by long sequences of reciprocating "negative affect" (i.e., the husband's negative affect would be followed by the wife's negative affect, followed by the husband's negative affect, etc.).

Of course, frequency counts and process measures of the parent-child interaction can provide convergent and complementary information. For instance, process measures (especially those that are time-based) require relatively large samples of behavior which often renders them insensitive to patterns in relatively low rate behaviors

(e.g., hitting), whereas frequency counts of these behaviors may suggest group differences. For another instance, because frequency measures have been used extensively they can be employed to assess the validity of process measures. Finally, frequency measures typically are obtained more efficiently and are more practical for clinical use. Thus, if a relation between sequence measures and frequency measures is obtained then the frequency measure would provide a clinically useful and efficient measure of the process.

Selected Review of Relevant Social Interaction Process Research

The process of social leading and following is considered to be the foundation upon which social competence originates and develops (Lewis & Freedle, 1973; Stern, 1971; Tronick, Heidelise, & Brazelton, 1977). This process originates in the face-to-face interactions between the parent(s) and infant (Hofer, 1981; Stern, 1971; Brazelton, Koslowski, & Main, 1974) and continues throughout the course of a person's social development (Davis, 1982; Maccoby, 1980). Competent parent-infant interactions occur when the child is able to signal his status and needs effectively and to respond effectively to parental interventions, and when the parent is able to interpret the child's status and needs so as to effectively respond with the right behavior at the right time in the right intensity. A number of researchers have attempted to quantify this and other aspects of the parent-infant relationship in order to relate it to later

cognitive, social, emotional, and individual development (Tronick et al., 1977; Bowlby, 1969).

A number of studies conducted in the 1970s attempted to document interaction patterns between parent and infant during face-to-face dyadic interactions. In 1971, Stern studied the face-to-face interactions between a mother and her 3-1/2-month-old twins. Citing developmental research about the importance of gaze, Stern had observers code parent and infant gaze behaviors (from videotapes) into dichotomous categories of gaze toward or away for both the mother and infant, resulting in a total of four possible states. In addition to providing descriptions of how maternal and infant behaviors merge to produce mutual interactive sequences (e.g., both gazing away from each other to both gazing at each other), he used running correlations to assert that "Statistically, the mother is more often the initiator of the mutual pattern; but the pattern can be initiated by either" (Stern, 1971, p. 512). Unfortunately, it is difficult to generalize from the results of this study given the small sample size, and because of Stern's inappropriate use of running correlations to analyze crosscorrelations. The latter limitation will be addressed in more detail shortly.

Brazelton, Koslowski, and Main (1974) studied five parent-infant dyads in which the infants were between 2 and 20 weeks old. Mother and infant behaviors were videotaped simultaneously by two cameras and then merged on a split screen with a time code superimposed, which allowed slow

motion or frame-by-frame analysis. A variety of maternal and infant behaviors were coded from these videotapes. Brazelton et al. (1974) analyzed the data visually using time-series graphs and described a mother-infant cycle characterized by gradual transitions from attention to inattention states. They concluded that "The most important rule for maintaining an interaction seemed to be that a mother develop a sensitivity to her infant's capacity for attention and his need for withdrawal--partial or complete--after a period of attention to her" (Brazelton et al., 1974, p. 59).

In a more methodologically sophisticated study, Stern (1974) examined the moment-by-moment vocal, facial, and gaze interactions in eight mother-infant dyads. Each dyad was composed of premature (by weight criteria) twin infants between the ages of 3 and 4 months. He was interested in investigating the bidirectional nature of parent-infant interaction during feeding and spontaneous social play situations. As before (Stern, 1971), he used a dichotomous gaze "away-toward" category system. Stern (1974) used transitional probability analysis and descriptive analyses to conclude that infants used attention-inattention to control the interaction, whereas the mother controlled the interaction through her facial and vocal behaviors. In particular, he reported that the mother was more likely to lead by gazing at the infant until the infant followed by gazing back at her. Having achieved this mutual gazing state, the infant regulated his attentional and affective

tolerance by averting his gaze. Stern (1974) concluded that during parent-infant interaction, gaze functions to regulate social contact and stimulation, and that coordinated sequences of attention-inattention represent a parent-infant dyad that is communicating their status, needs, and intentions effectively. In addition to the rich description of parent-infant interaction, this study also provided a sequential account of attention in the dyadic relationship.

Pioneering work by Tronick et al. (1977) was directed towards quantifying how the parent-infant dyad develops, and maintains, mutual affective and attentional states through the course of their face-to-face interaction. These researchers used the same videotape recording procedure used by Brazelton et al. (1974) with three parent-infant dyads as subjects in which the latter ranged from 11 to 13 weeks old. Six infant and parent expressive behaviors were coded. Behaviors were ranked on the degree to which they reflected the parent's and child's affective and attentional involvement. This ranking resulted in a univariate scale ranging from maximum positive involvement to maximum negative involvement. Each dyad's involvement score was then plotted across time, creating a time-series graph which summarized their interaction. Tronick et al. (1977) statistically assessed the degree of cycling and mutuality by correlating the rankings for each mother-infant dyad at successive 10 second intervals (i.e., each correlation was based on 10 seconds of interaction such that the first correlation was

based on seconds 1-10, the second correlation was based on seconds 2-11, etc.). They interpreted periods of high positive correlations as indicative of mutual cycling, and periods of high negative correlations as indicating that the mother and infant were almost perfectly out of phase with each other; periods of low to medium positive correlations indicated periods of disharmony. They concluded that

Long periods of interaction result during which the quality of the infants' displays approaches an almost perfect synchrony with the mothers'. During these periods in which mutual cycling occurs, as evidenced by high positive correlations, the infant and the mother show a cyclic acceleration and deceleration of their affective and attentional involvement that closely resembles a homeostatic curve" (Tronick et al., 1977, p. 78).

Periods of desynchrony are important because they represent crisis periods (Riegel, 1976) when the parent and infant are not communicating well.

Gottman and Ringland (1981) criticized the conclusions of Tronick et al. (1977) on statistical grounds because nonzero correlations would be produced even in the case of no interaction! They wrote that

If the mother and infant's behavior were entirely cyclic, with unequal frequencies, the behavior of each would be completely determined by its own past and no knowledge would be gained by knowing the behavior of the other. This is the case of no interaction . . . and . . . the running correlations would be nonzero . . . because . . . the mother's and baby's cycles would be successively in phase (giving positive correlations) and successively out of phase (giving negative correlations) (Gottman & Ringland, 1981, pp. 396-397).

Gottman and Ringland (1981) advanced time-series analysis as an appropriate methodology to study these and other types of social interaction. Gottman and Ringland's methodology will be detailed in the method section because it provided the basis for the time series analytic procedures used in the present study.

In summary, the parent-infant interaction literature reviewed is significant for its pioneering work in the area of observational measurement and lucid descriptions of dyadic interaction. The results of this research suggest that social leading and following is instrumental in the development of social competence and fundamental to the development and maintenance of a healthy parent-infant relationship. However, pervasive methodological problems, including small sample sizes and inappropriate statistical methods reliability methods, limit the generalizability of these conclusions.

Dominance in Marital Interaction

Gottman (1979) used an intuitive univariate scaling procedure similar to that used by Brazelton et al. (1974) and Tronick et al. (1977) to assess patterns of affective leading and following in his research with clinic-referred and nonreferred married couples. Using videotaped interactions, Gottman (1979) assigned positive or negative values to both the speaker's and listener's affective behaviors during discussions of low and high conflict improvisation tasks. He summed these scores within each turn-taking episode, and then

summed across episodes, resulting in a cumulative record or time series. Gottman defined two types of affect, mood and expressions, which were distinguished by slower and faster changes, respectively, in facial affect displays. He analyzed the data using bivariate cross-spectral time-series analysis procedures. Gottman (1977) reported an interaction between type of affect (mood versus expression) and the level of task conflict such that significant and predictable patterns of leading and following in emotional expression (rapidly changing affect component) were observed between groups only during high conflict tasks. In particular, during high conflict tasks the clinic husband's emotional expression was found to predict his wife's emotional expression, but not vice versa. Gottman (1979) interpreted these results as suggesting that clinic-referred wives are emotionally responsive to their husbands, but not vice versa.

Gottman's (1977) pioneering research is important for a number of reasons. Prior to his investigations there had been more speculation about marital interaction than empirical research. Indeed, marital research had provided limited study of interactions in general, and the process of leading and following in particular. Gottman (1977) demonstrated how observational measures of leading and following can be used to quantify interpersonal processes that heretofore had been addressed only metaphorically or anecdotally. His time-series results provide an excellent illustration of how measures of leading and following

discriminate between clinic and nonreferred dyads as a function of situational context (i.e., level of task conflict). Unfortunately, it is difficult to generalize from Gottman's conclusions because of limitations in the time-series method he selected and because the psychometric properties (including interobserver reliability) of Gottman's (1977) measure of leading and following are unknown. Both of these limitations will be detailed in the methods section. Once the psychometric properties of Gottman's measure of leading and following is known, it has the potential to improve clinic-nonclinic classifications, assess therapy progress, and evaluate therapy outcome.

Gottman's (1979) marital interaction research advanced social interaction research methods and elucidated that dysfunctional interactions are represented by particular patterns of leading and following, within specific contexts, and that these interaction process measures have important clinical implications for assessment and treatment.

Summary

The combined results of the parent-infant and marital interaction literatures reviewed suggest the following points. Under certain conditions dominance is indicative of functional interactions (e.g., the parent-infant synchrony detailed in the parent-infant literature), whereas under other conditions dominance is indicative of dysfunctional interactions (e.g., affective dominance as detailed in the marital interaction literature). The fact that dominance can

indicate either functional or dysfunctional interactions suggests that the ability to engage and disengage in dominant interactions is necessary but not sufficient for the development of social competence. In some ways the results of the parent-infant and marital interaction literatures seem contradictory. In the parent-infant interaction literature, dominance is viewed as both the goal of the dyad and when present, as a positive index of the dyad's developing social competence; while in the marital interaction research dominance is considered to be indicative of a dysfunctional marital relationship. Thus, dominance is said to both presuppose competent social interaction and at the same time reflect it. This apparent confusion likely reflects the fact that dominance is a global measure of the extent to which each person's behavior is influenced by the behavior of the other, that the interpretation of a particular type of dominance depends upon the context in which the interaction occurs, and that developmental variables affect the interpretation of dominance. A similar argument has been put forth by Gottman and Ringland (1981). They assert that dominance

is a function of the interactants and of the situational context of the interaction. The conceptual label given to asymmetry in predictability should vary as a function of the dependent measures, the context (e.g., the goals and tasks of the interaction), and the nature of the interactants (Gottman & Ringland, 1981, p.385).

In order to interpret this construct, interaction research needs to proceed in three directions:

(a) establishing a psychometrically sound measure of dominance; (b) manipulating different properties of the interactants and their context to clarify its interpretation; and (c) describing empirically the interactive behaviors that establish dominance.

Statement of Problem

Social leading and following is considered important to the development of social competence in general and to PCIT in particular. PCIT research, however, has provided limited study of the process of leading and following. Leading and following in PCIT has been measured only minimally and at only a relatively gross level (e.g., reflections follow, commands lead). Consequently, the potential ability of a measure of leading and following to improve clinic-nonclinic classifications, assess therapy progress, and evaluate outcome has not been evaluated. A measure of lead-follow interaction patterns should indicate how well the parents are able to lead and follow. This would be useful in discriminating clinic from nonclinic dyads, assessing suitability for treatment, and evaluating therapeutic progress and outcome.

Clearly, a construct alleged this important must be carefully defined and must exhibit adequate psychometric properties.

Defining Leading and Following Operationally

The first step in evaluating the importance of leading and following in PCIT is an operational definition of the construct.

Gottman (1979) used the term "dominance" to describe patterns of leading and following during marital interaction. Gottman's notion of dominance was important for two reasons. First, it allowed the bidirectional process of leading and following to be incorporated into one term; the person who was leading was dominant, and by implication the other person was following. Second, Gottman (1979) suggested that patterns of social leading and following (i.e., dominance) can be quantified in probability terms. Gottman (1979) used the notion of "asymmetry in predictability" in his studies of marital interactions to determine which partner was leading and which partner was following in affect and mood. Gottman's notion of asymmetry in predictability translated into parent and child terms simply states that if the child's behavior is more predictable from the parent's past behavior than from the child's own past behavior then the parent is considered to be leading the child. Another way of saying this is that the parent is leading the child when, over the course of the interaction, her behavior is a more probable antecedent to the child's behavior than the child's own past behavior. The pattern of child leading and parent following taught in CDI expressed in probability terms is:

$$p(\text{parent behavior/child behavior}) > p(\text{parent behavior/parent behavior})$$

which is read as the conditional probability of a parent behavior given a prior child behavior is greater than the conditional probability of a parent behavior given a prior parent behavior. Thus, if leading and following are important, then during CDI, for example, the mother should lag behind the child's behavior in a predictable way. This relationship should be represented in sequential measures of the parent-child interaction.

Figure 1 illustrates the four possible patterns of leading and following between the parent and child. The cell in the upper left defines an interaction in which the child is dominant (i.e., the child leads and the parent follows). This is the pattern expected in CDI. The cell in the lower right corner defines an interaction in which the mother is dominant (i.e., the mother leads and the child follows). The cell in the lower left defines an interaction in which the mother and child are essentially playing independently of one another. The cell in the upper right corner defines a bidirectional relationship in which the mother's and child's play alternates between leading and following. Knowing the clinical play situation, associated affect, content, and issue would help to determine whether a bidirectional pattern is indicative of a "power struggle," or of the sharing, and friendly dialogue of an egalitarian interaction.

Synchronous interactions represent a particular subset of dominance patterns. Synchronous interactions have been

ASYMMETRY (CHILD DOMINANT) C ——— > M	BIDIRECTIONAL C < ——— > M
INDEPENDENT C M	ASYMMETRY (MOTHER DOMINANT) M ——— > C

(adapted from Gottman & Ringland, 1981)

Figure 1

LEADING AND FOLLOWING MATRIX

defined by either mutuality (performing the same behaviors at the same time, as for example, during a handshake, greeting or good-bye, postural mirroring, etc.) or by lead-follow behaviors (i.e., performing one or more behaviors before or after the other person in the interaction, such as taking turns during dialogue). Synchrony, then, is indicated by all types of dominance except independence. Mother or child dominance are indicative of synchrony because either the mother follows the child's lead by some period of time or the child follows the mother's lead by some period of time. Bidirectional interactions are indicative of synchrony because the parent and child are acting simultaneously, or because they are actively switching the lead back and forth.

Advantages of the Dominance Construct

Gottman's dominance construct provides a framework within which to integrate concepts and terms that have been used in different literatures. Parent-infant researchers have used the term "synchrony," while PCIT researchers have used the term "leading and following," and marital interaction researchers have used the term "dominance" to refer to observed patterns of asymmetrical or mutual influence during social interaction. Gottman's dominance construct provides conceptual clarity across these fields because it incorporates prior definitions. At the same time it advances these fields by providing an operational definition and a statistical measure (i.e., a multi-parameter equation and/or a classification) of leading and following

for a variety of interactive data. Summarizing complex and dynamic interactions in this way is important because it allows clinical researchers to provide measures of interaction patterns to complement their assessment and intervention procedures. Without such measures there is no direct way to assess the status and change in the dyadic relationship.

The ability to detect dominance patterns in overall interaction patterns has a number of advantages. First, it overcomes problems of using specific behaviors or sequences to establish dominance (Gottman 1979; Gottman & Parkhurst, 1980). For instance, the dominance statistic is superior to frequency counts of specific behaviors because it provides a measure of leading and following across specific types of play interactions (compliance, sharing, giving, object struggles, monologue, dialogue, rearranging, taking, etc). Obviously, there are numerous ways in which a parent can influence the child's behavior; a statistic that assesses dominance across separate instances is more likely to provide a more accurate measurement. Second, the ability to obtain "macro" measures (i.e., a dominance summary equation and/or classification) and "micro" measures (i.e., patterns in specific codes) allows for complementary analyses at different levels of behavioral resolution. Third, dominance can be used as a dependent variable in studies evaluating the influence of various factors on dyadic interactions.

Statement of Objectives

The purpose of this study was to examine the inter-observer reliability, and the discriminant, concurrent, and convergent validity of an observational measure of dominance previously developed by Wruble, Sorensen, Sheeber, & Eyberg (1989) for assessing this aspect of parent-child interaction during PCIT. All of these purposes have important implications for clinical assessment and intervention.

The discriminant validity of the dominance measure was assessed by comparing dominance in clinic dyads, before and after treatment, with dominance in nonclinic dyads at the same assessment intervals. Assessing dominance between groups and across treatment addresses three important questions: (1) is the dominance measure valid for discriminating conduct-problem-referred from nonreferred dyads, (2) how does treatment affect dominance, and (3) is dominance an important component in PCIT? Dominance would be considered important to PCIT if the clinic and nonclinic groups differed before treatment but behaved more similarly after treatment. A measure of dominance with good discriminant validity can improve clinic-nonclinic classifications by providing a sensitive measure of functional or dysfunctional interactions. Existing frequency count measures may not provide such a direct and sensitive measure of the interactions (e.g., frequency patterns may be the same but interaction patterns may be different).

Comparing a measure of dominance with an existing treatment outcome measure allows a test of the previously untested assumption that leading and following is an important component of PCIT. The concurrent validity of the dominance measure will be assessed by comparing it with the two scores from the Eyberg Child Behavior Inventory (ECBI; Eyberg, 1974). The ECBI has been shown to have good psychometric properties including being able to discriminate children with conduct problem behaviors from non-referred children (Eyberg & Robinson, 1983), relating significantly to observational measures of parent-child interactions (Webster-Stratton & Eyberg, 1982), and providing a sensitive measure of treatment outcome (Eyberg & Robinson, 1982).

Attempts to measure the dominance construct have for the most part relied on detailed, often frame-by-frame behavioral coding of dyadic interaction. The advantage of this type of measure is that it allows for a precise description of the behaviors involved in dominance between each interactant. One disadvantage is that the procedure is tedious and extremely time consuming which makes it impractical for clinical use. Recently, Bernieri, Reznick, and Rosenthal (1988) had observers rate synchrony (which, as mentioned earlier, is a type of dominance) in parent-infant interactions along three dimensions (simultaneous movement, tempo/rhythm, and overall impression of interpersonal harmony) each on a 1-9 Likert-type scale. By manipulating the timing and partner variables in the video film clips for

each interaction they found that these scales were highly intercorrelated and that observers could reliably assess dominant (i.e., synchronous) interactions. The advantage of this more subjective coding strategy is that it seems to provide a good estimate of dominance in a period of time that is practical clinically. One conceptual problem with this type of scoring system is that one is unsure about what behaviors the coders are using in evaluating dominance. This is important for two reasons. One, researchers have identified different types of dominance (e.g., affective, attentional, motoric, etc.) and it would seem important to know how these are related to each other and how they function separately. Assessing dominance in a global way does not allow for such specification. Two, in order to teach dominance, therapists need to know how specific parent-child behaviors are related sequentially over time. Global measures of dominance do not provide this information to the therapist. Ideally, clinical ratings of dominance would be empirically derived from the interactional patterns that establish dominance. This would allow clinician's to assess these patterns efficiently and to teach these patterns. In this study dominance measures were obtained from detailed observational coding and from observer ratings of the parent-child interactions.

Predictions About Dominance in PCIT

The design of the present study examined the effects of group (clinic or nonclinic), situation (CDI or PDI), and

assessment interval (pre and post-treatment for the clinic group) on parent and child leading and following behavior. A basic assumption in this study is that if leading and following are important, then the parent and child data should take certain forms. The demand characteristics of the two clinical play situations, CDI and PDI, facilitated forming hypotheses. A basic rule in forming the hypotheses was that at pre-treatment the clinic dyads will behave in a way inconsistent with the demands of the CDI-PDI situations. For instance, in CDI at pre-treatment clinic parents will lead when they are supposed to follow. Hypotheses were advanced for both parents and children. The hypotheses of most interest were those for the participant who should be following in the situation. This is because the statistic used to measure dominance is based on the relation between current behavior and past behavior. Thus, a large dominance value for a child would indicate that the child's behavior was highly predictable from the parent's prior behavior at a level greater than would be expected by chance alone. By implication, and in statistical terms, the parent would be considered to be leading the interaction (i.e., dominant) because the child's behavior is more predictable from the parent's behavior than from the child's own prior behavior.

The following hypotheses were made:

- (a) at CDI pre-treatment, clinic parents will follow their children's play behaviors less than parents in the comparison

group because clinic parents often have difficulty following their children's play behaviors.

(b) PCIT should have the effect of improving the clinic parents' following behavior (i.e., an increase in predictability between antecedent child behavior and subsequent parent behavior) such that at post-treatment they will follow their children at a level comparable with that exhibited by the nonclinic parents.

(c) in CDI pre-treatment, children in the clinic group will exhibit more following behavior than children in the comparison group because clinical experience suggests that clinic parents' often lead in CDI when they are supposed to be following.

(d) in CDI post-treatment PCIT will have the effect of both decreasing the parents' attempts to lead and improving the children's self-management of their own behavior. Therefore, clinic children will follow their parents less compared to pre-treatment CDI, and at a level not significantly different from that of the comparison group children.

(e) at PDI pre-treatment, parents in the clinic group will follow their children more than parents in the comparison group. This is because clinic parents have difficulty leading effectively and often respond ineffectively to their children's deviant behavior resulting in the clinic parents following their child's behavior. In contrast, non-referred parents are able to lead effectively, control their

children's behavior, and are better able to alternate between leading and following.

(f) at PDI post-treatment, parents in the clinic group will follow their children less than they did in PDI at pre-treatment, and at a level not significantly different from non-referred parents because PCIT teaches clinic parents differential social attention skills and how to effectively alternate between leading and following.

(g) non-referred parents did not receive treatment so they should not differ significantly in the amount they follow their children in CDI or PDI over the two assessment intervals.

(h) at PDI pre-treatment, the clinic children will follow their parents' lead less than nonreferred children because clinic children typically oppose their parents attempts to lead, and clinic children control the interaction through their deviant behavior.

(i) at PDI post-treatment, PCIT will have functioned to improve the clinic children's following behavior such that the clinic and nonreferred children will not differ significantly in the amount they follow their parents.

Predictions About the Convergent and Concurrent Validity of the Dominance Measures

The convergent validity of the dominance measure will be indicated by a positive correlation between the measure of dominance derived from the Dominance Coding System (DCS; Wruble, 1990; see Appendix 1) and the measures of dominance

obtained from the Dyadic Interaction Scale (DIS; see Appendix 2).

The concurrent validity of the dominance measure will be indicated by the pattern of correlations between the DCS measures of dominance and the two ECBI scores for each level of the experimental variables. The following hypotheses were advanced: (a) in CDI, at each assessment interval and for each group, the ECBI will correlate positively with child following. High ECBI scores indicate frequent conduct problem behaviors which are experienced as problematic by parents. High levels of child following in CDI indicates dysfunctional interactions because the parent should be following the child. In particular, clinic parents not only report that their children exhibit more conduct problem behaviors, but at pre-treatment clinic parents are also more likely to lead in CDI when they should be following. The ECBI will also correlate positively with child following for clinic children at post-treatment because PCIT should have the effect of improving the clinic parents' following behavior resulting in levels of child following and child deviant behaviors consistent with those exhibited by the non-referred children at both assessment intervals. Thus, ECBI scores and child following will be positively correlated for the non-referred children in CDI at both assessment intervals; (b) in PDI, at each assessment interval and for each group, the ECBI will not be significantly correlated with child following. Elevated ECBI scores are always

considered indicative of frequent or problematic conduct problem behaviors. Leading and following in PDI, as detailed previously, is expected to be reciprocal and alternating. Thus, the interpretation of child following in PDI depends on how much the mother attempts to lead and how successful she is in her attempts; (c) in CDI, at each assessment interval and for each group, the ECBI will correlate negatively with parent following. The ECBI will correlate negatively with parent following for the clinic parents in CDI at pre and post-treatment, but perhaps for different reasons. At pre-treatment CDI, clinic parents have difficulty following their children's behavior and report high levels of child deviant behavior. At post-treatment, PCIT will have functioned to improve the parent's following while concomitantly decreasing child deviant behavior. The ECBI will be negatively correlated with parent following for non-referred parents in CDI at the two assessment intervals, because non-referred parents should both consistently follow their children and report low levels of conduct problem behaviors; (d) in PDI, at each assessment interval and for each group, the ECBI will not be significantly correlated with parent following. The interpretation of parent following in PDI, as discussed previously, depends on the balance the parent strikes between alternating between leading and following.

CHAPTER II

METHODS

Subjects

The videotapes of subjects used in this study were from 24 parent-child dyads who were observed as part of another research project (Eisenstadt, 1990). One-half of these dyads (1 female, 11 male; mean age in months = 57.2) were referred for treatment of their child's behavior problems. The other half (3 female, 9 male children; mean age 56.9 months) were solicited through advertisements in local day care and preschools in the Gainesville area. The groups did not differ significantly by age, $t(22) = .05$, ns, income $t(22) = .87$, ns, or child gender $\chi^2(1, N = 24) = 1.2$, ns. At the first assessment interval, the two groups' mean ECBI Intensity, $t(22) = 4.14$, $p < .0001$; and Problem, $t(22) = 5.32$, $p < .0001$, scores were significantly different.

The mother of each dyad had completed an ECBI and had been videotaped in two 5-min standard situations during standard Dyadic Parent-Child Interaction Coding System (DPICS; Eyberg & Robinson, 1983) observations. Each dyadic interaction was conducted in the play room in the Psychology Clinic at the University of Florida. The room was furnished with a table, chairs, a blackboard, chalk, eraser, and a

choice of toys including an alphabet teacher, a variety of magnetic and wooden building blocks, and Lincoln Logs. Each dyadic interaction was videotaped from behind a one-way mirror.

Measures

Dominance Coding System (DCS)

PCIT involves, by definition, training the mothers to use verbal (e.g., praise, descriptions) and nonverbal behaviors (imitating, ignoring, watching) to respond to their child's appropriate and inappropriate behaviors. Thus, comprehensive assessment of mother-child interaction requires assessment of both behavioral dimensions. Furthermore, the importance of using both verbal and nonverbal behaviors in assessing dominance in conduct problem behavior mother-child dyads was suggested from the results of a pilot study by Wruble et al.(1989). These clinical researchers coded a wide range of mother and child verbal and nonverbal behavior and reported both that mothers are more active verbally than their children, that children are more active nonverbally than their mothers, and that different dominance profiles resulted when using exclusively verbal or nonverbal behaviors (Wruble et al., 1989).

The DPICS observational system is a standardized behavioral observation instrument which has been shown to discriminate clinic referred from non-referred children and to be sensitive to changes from pre- to post-treatment. DPICS was expanded to include 48 child and mother play

behaviors, and 3 additional verbal behaviors. The play behaviors were adopted from the Parent-Child Interaction Coding System (PACHINCO) developed by Wruble, Sheeber, Sorensen, & Eyberg (1987). Another addition was the introduction of a time-base to the system allowing each mother and child behavior to be associated with a particular point in time. This was done to provide a more accurate description of the sequence of behaviors between mother and child.

The Dominance Coding System (DCS; Wruble, 1990) was developed for the present study based upon the results of a pilot study (Wruble et al., 1989). The DCS coding manual is included as Appendix 1. The DCS consisted of the expanded DPICS verbalizations, and two general types of nonverbal play behaviors: activity, and the referent of the activity which were adopted from the PACHINCO coding system. With few exceptions, only behaviors lasting for at least one second were coded. Behaviors lasting less than one second, such as brief glances away from the other person, or brief pauses in activities, were not scored because they were considered less important for the purposes of this study, and because they would likely be difficult to code reliably. Exceptions were made for behaviors which typically last for less than one second, such as hitting, touching, and caressing, because they are important interpersonal behaviors and because clinical experience suggested that their high degree of

recognition and face validity would allow them to be coded reliably.

Each behavioral unit was defined by the natural shift between behaviors as the mother and child interacted, such as when the mother or child changed their behavior (e.g., from building to watching) or made an intelligible verbalization. Therefore, the length between behavior changes could vary widely from a verbal acknowledgement or the length of time necessary to speak a sentence, to the length of time necessary to finish a complex building task and start another task. Recording was "activated" by the onset of a new behavior, that is, whenever the mother or child spoke, changed their play activity, or the object with which they were playing. Each of these changes was viewed as an opportunity for the mother or child to lead or follow the other's play. Observers recorded the time and valence (positive, negative, or neutral) of each behavior. Verbalizations were collapsed into positive (e.g., praise), neutral (e.g., descriptions, reflections), or negative (e.g., criticism) statements in line with their functional description in the Eyberg and Robinson (1983) DPICS coding manual (Wruble, 1990). Nonverbal behaviors were assigned a valence depending on the social impact of the behavior; prosocial behaviors such as giving or caressing were considered positive behaviors while deviant behaviors such as hitting and destructive play were considered negative behaviors (see Wruble, 1990; Appendix 1). Information about

the time of an event was provided by reference to a running digital time code superimposed previously on each videotape.

Mother and child univariate time series, representing natural shifts in play activity and speech, were derived from these data.

Dyadic Interaction Scale (DIS)

The Dyadic Interaction Scale (DIS) (see Appendix 2) was created by the author for use in this study. The DIS consists of a total of four items. Two items are directed toward assessing how much the observer thinks the child is leading and following, and two items are directed towards assessing how much the observer thinks the mother is leading and following. Each of the four items is rated on a 5 point scale ranging from "Almost None" to "Almost Completely," resulting in a total of four measures. Observers rated leading and following immediately after viewing each 5 min interaction.

Eyberg Child Behavior Inventory (ECBI)

The ECBI (Eyberg, 1974) is a 36 item parent rating scale of conduct problem behaviors for use with children between the ages of 2 and 17. Each behavior is rated on a frequency of occurrence scale (ranging from 1 = never to 7 = always occurs) and on a yes-no problem scale. The ECBI, then, provides two scores. The intensity score is obtained by summing across all frequency of occurrence scores. The problem score is obtained by summing the "yes" responses. The ECBI provides a sensitive measure of treatment outcome in

children with conduct problem behaviors (Eyberg & Robinson, 1982; Webster-Stratton, 1984), relates significantly to observational measures of parent-child interactions (Webster-Stratton & Eyberg, 1982) and discriminates conduct problem children and adolescents from other clinic-referred and non-referred children (Eyberg & Robinson, 1983).

Procedures

Behavioral observers coded from videotapes of mother-child interactions recorded prior to this study. Both CDI and PDI, pre- and post-treatment, interactions were coded for the clinic group, and for the non-referred group at two comparable assessment intervals. The coders used the following materials: a hi-fidelity videocassette recorder with remote control, data sheets for verbal or nonverbal behaviors, pencils, and a copy of the coding manual.

The same videotaped interactions of the 24 dyads (12 clinic and 12 nonclinic) described previously were also coded using the Dyadic Interaction Scale (DIS), by seven first year graduate students in the clinical psychology program at the University of Florida. These coders were considered more appropriate than either naive undergraduate students or "expert" PCIT clinicians because they were beginning their clinical training but were not yet familiar enough with PCIT to expect that their ratings of leading and following would be biased by their knowledge of the program. Each coder viewed 22, five-min interactions which were randomized along all experimental conditions. Of these, 16 were viewed by

only one coder, while the remaining were assessed by two coders for reliability purposes.

Observer Training and Coding

Four coders participated in coding the dyadic interactions. Three of the coders were undergraduate students receiving course credit for their participation. The fourth coder was a research assistant trained to code exclusively the verbal data. The author served as the reliability coder.

Coders were first trained in the use of the coding system in groups of three to four each, then in groups of two, and finally individually. Once the coders had achieved an acceptable level of percentage agreement (85%) with a criterion tape, they were allowed to code the interactions of the subjects used in this study.

For each five-min videotaped interaction, observers used a multiple pass, slow forward-fast backward, recording strategy to code mother and child behavior separately. Each coder would pass through a particular segment a number of times until he or she determined what code(s) (e.g., activity code and activity referent code) to assign.

Training Observers and Reliability Assessment

Observers were trained according to the following procedure. Observers were first trained with previously coded criterion videotapes using a copy of the DCS manual and coding sheets. A criterion tape refers to a videotaped mother-child interaction that has been previously coded by

two or more "expert" observers. Consequently, measures of its contents provide a standard against which other observers can be compared. The criterion videotapes used in this study had been used in another study (Wruble et al., 1989) and had been coded by at least two advanced graduate students and two undergraduate coders with demonstrated reliability.

Accuracy refers to the degree to which coders approximate the measures of the criterion tape. Observers were trained to achieve a minimum of 85% accuracy based on frequency counts of agreements and disagreements, as assessed by percent agreement, before they were allowed to score the videotapes of dyads used in this study. Observers were blind with respect to all experimental conditions.

Data Analysis

Time Series Analysis

A time series is defined as one or more random variables assessed through time (Gottman, 1981). Time series parameters relevant to the present study include trend, autocorrelation and crosscorrelation.

Two general types of trend may exist, linear and cyclical (Gottman, 1981). Linear trend refers to a positive or negative slope in the time series. A positive trend, for instance, would be represented by a cumulative record of a consistent rate of responding (e.g., that associated with a variable interval schedule of reinforcement). Cyclical trend refers to a rhythmic component in the series. For example, Glass, Wilson, & Gottman (1975) noted that time series of

retail sales exhibits a 12 month cyclical trend (i.e., prices in December are highly correlated with prices last December, and because of the post-holiday drop in retail sales, retail prices in January are highly correlated with the same drop the previous January, etc.). Trend is important because it provides information about one of the assumptions of a time series.

Time-series analysis assumes that the data are stationary (Gottman, 1981). The first assumption is that the mean and variance of the time series remains the same independent of time. In other words, the time series must exhibit no linear or cyclical trend and the variance must be constant throughout the series.

The second assumption is that autocorrelations do not change as a function of location in the time series. Autocorrelation refers to the relationship between present values and past values of a series. Autocorrelation is reportedly pervasive in behavioral data (Jones, Vaught, & Weinrott, 1977). With regard to the present study, accounting for autocorrelation is important for at least two reasons. First, its presence violates the assumptions of independent and randomly distributed error terms common to traditional inferential statistics. Failure to correct for autocorrelation results in biased estimates of confidence intervals (Gottman, 1981) and of significance tests (Kazdin, 1976; Hartmann, Gottman, Jones, Gardner, Kazdin, & Vaught, 1980). For instance, the presence of positive

autocorrelation results in a smaller estimate of the standard error term which artificially inflates the estimate of the F-value, thereby increasing the Type I error rate. Second, the effect of autocorrelation must be removed in order to assess crosscorrelation.

Crosscorrelation refers to the relationship between the values in one time series with the values in another time series. Applied to social interaction, for instance, it refers to the degree to which an individual's behavior (e.g., the child) is predictable from the past behavior of the other person (e.g., the mother) (Gottman, 1981).

Patterns of autocorrelation and crosscorrelation have been used to determine dominance in interactions. Heidelise et al.. (1977) used contingency table data to investigate auto- and cross-dependency in mother-infant interactions. Unfortunately, for reasons to be discussed shortly, their analyses did not control for relations between autocorrelation and crosscorrelation, which is necessary to determine dominance.

Thomas and Martin (1976) developed a two component model of dyadic interaction. They speculated that parent-infant interaction reflects the operation of a self-regulatory component and a social interactive component. They provided a statistical model of parent-infant interactions from which they obtained summary statistics representing both components of the interaction. According to their model, the behavior of a person at a point in time was considered a linear

function of the person's own past behavior and the past behavior of the person with whom he/she was interacting. Thomas and Martin's (1976) model, however, is unable to provide an adequate test of dominance for two reasons. First, they used crosscorrelation measures to estimate the values of the interactive components, but they did not control for the effects of autocorrelation originating from the self-regulatory component; and autocorrelation and crosscorrelation can be related such that crosscorrelations can be produced from strong autocorrelations (Gottman & Ringland, 1981). Moreover, to infer, for example, mother dominance in parent-child interactions, the behavior of the child must be more predictable from the past behavior of the mother than from the past behavior of the child. In order to infer dominance, then, two models must be compared; a model with autocorrelation only and a model with both autocorrelation and crosscorrelation. Second, Thomas and Martin (1976) did not provide an algorithm to fit models with greater than two parameters, although conceivably their model could. Consequently, there is no way of knowing whether the Thomas and Martin (1976) two-parameter model is the model of best fit (i.e., explains the most variance in the interaction).

Gottman and Ringland (1981) presented a model of dyadic interaction that accounts for the methodological and statistical shortcomings of the Thomas and Martin (1976) model. Gottman and Ringland's methodology will be detailed

because it provided the basis for the time series analytic procedures used in this study.

Broadly speaking, Gottman and Ringland's main purpose was to determine the most parsimonious model to predict the behavior of a mother and her infant during face-to-face interactions. Their methodology is applicable, of course, to other types of interaction and hereafter will be applied with reference to parent-child interaction.

The Gottman and Ringland (1981) procedure involved using a maximum likelihood procedure to compare a reduced model, in which only autocorrelation parameters are used to predict the mother or child series, with the prediction from a full model in which both auto- and crosscorrelation terms are included. The null hypothesis of this procedure is that including crosscorrelation terms provides no increase in prediction, suggesting that the parent's or child's behavior is a function only of their own past behavior.

The Gottman and Ringland (1981) algorithm involved the following steps. First, they used an ordinary least squares procedure to estimate the initial autocorrelation parameters. Once estimated, slightly larger autoregressive parameters were estimated. Different combinations of these parameters were then combined with the crosscorrelation parameter estimates, resulting in a full and reduced model with slightly inflated estimates. Then, using a least squares procedure adapted from Mann and Wald (1943), Gottman and Ringland (1983) reduced these models in a stepwise process.

Specifically, for both mother and child time series, the least squares procedure selected the best full model and the best reduced model to fit each series. Then, separate likelihood ratio tests compared the full versus the reduced models for the null hypothesis that crosscorrelation terms do not contribute to the prediction of the mother or child series. The likelihood ratio statistic for this test is a fraction in which the numerator is the likelihood of the data fit with auto- and crosscorrelation terms, and the denominator is the likelihood of the data fit with only autocorrelation terms. All likelihood ratio statistics are approximately distributed as a Chi Square with degrees of freedom equal to the difference in the number of parameters between the full and reduced models (Lindgren, 1968). Last, the parameter values of each full model were varied to examine if a better fitting model could be achieved, and similarly, additional autoregressive terms were added to the reduced model to examine if a better fitting model could be achieved. Neither of these tests were expected to give significant results, and served essentially as checks on the internal validity of the procedure.

The advantages of the Gottman and Ringland (1981) procedure were that it permitted the assessment of crosscorrelation by controlling for the effects of autocorrelation, and it used a maximum likelihood procedure to choose a model of best fit. These models provided the additional benefits of providing an equation with parameter

estimates, residual variance information for both the mother and infant, and a direction of influence classification for the dyad.

The Gottman and Ringland (1981) procedure is not without both procedural and methodological limitations. First, the use of step-wise ordinary least squares to estimate the number and value of autoregressive parameters may not be the procedure of choice (Newton, 1988). Instead, Parzen's (1977) criterion autoregressive transfer function (CAT) has developed as a method to obtain stable estimates of the number of autoregressive parameters in the time series model.

The accuracy of the CAT criterion to detect white noise (i.e., random uncorrelated observations) has been reported elsewhere (Newton, 1988) and was assessed empirically in this study. Parzen's CAT criterion was used on 100 white noise processes, whose composition was randomly selected by the Timeslab (Newton, 1988) software program. If the CAT criterion was working properly it would be expected to correctly diagnose each time series as uncorrelated white noise. This process, then, served as a calibration or accuracy check on the performance of the CAT criterion. Results from a Monte Carlo computer simulation suggested that approximately 85% of the white noise processes were diagnosed as white noise by the CAT criterion.² This means that in

² The author is indebted to Mike Conlon for conducting the computer simulations to empirically determine the performance of the CAT criterion used in this study.

this study, the Type I error rate for the diagnosis of autocorrelation actually occurred at the .15 level. This level is more than the conventional .05 probability level, but should not affect the results of this study because any effect of autocorrelation on the cross-correlation parameters is automatically removed by the time-series algorithms used in this study. The Gottman and Ringland (1981) procedure was also compromised by a computational error in the likelihood ratio provided. This was corrected, making the statistical procedure used in the study a refinement of the Gottman and Ringland (1981) methodology.³

All analyses were conducted using TIMESLAB (Newton, 1988) statistical programs (see Appendix 3) and software.⁴ Inspection of a number of time series revealed that most were non-stationary. Therefore, linear trend was automatically removed from all time series. Detrending a time series does not affect autocorrelation or crosscorrelation because it involves removing a constant term from the series.

In the present study, the valence (e.g., positive, negative, or neutral) of each verbalization or each change in play behavior was collapsed into a binary value (1 = change, 0 = no change) in order to assess the sequential patterning

³ The author is completely indebted to Mike Conlon for detecting and ameliorating the problem discussed.

⁴ The author wishes to thank Mike Conlon for constructing the time-series macros used in calculating the dominance statistic.

between mother and child. In other words, time series were formed on the basis of assigning a value of one at the time when the mother or child changed their activity or made a statement, and zero values were assigned otherwise. For instance, if a child maintained his or her play activity and was silent for the first 9 seconds of the interaction but made a statement at time = 10 seconds, then this was represented in the time-series as 9 successive zeros (for the first nine seconds) followed by a 1 for the change in behavior at time = 10 seconds (i.e., 0000000001). Hence separate child and mother time-series were composed of a series of zeros and ones.

Time Series Models and Summary Measures

Two issues pervade time-based interaction research. One is the question of how far back in time to search for patterning. In a pilot study with conduct problem behavior mother-child dyads, Wruble et al.. (1989) determined that as the number of parameters (from 1 to 60) in the time-series models increased, the amount of variance accounted for by the models reached a point of diminishing returns. Each parameter represented one second. Based on the results of the Wruble et al. (1989) study, the time-series models used in the present study were limited to quantifying the lag between mother and child behaviors within 30 seconds.

The other question is how to summarize complex interactions; specifically, how to turn interaction process into interaction measures. Interaction researchers have

recommended using summary measures of interactions as dependent variables to answer groups comparison design questions (Bakeman & Gottman, 1985; Sackett, 1979). Six summary measures of dominance were formed by dividing the estimates of the 30 time-series parameters into 6 cumulative lag intervals. Thus, Chi-square values from latter lag intervals were based on earlier values. For instance, Chi-square values for lag interval one were based in the amount of crosscorrelation that occurred between the mother and child within a five sec time span, while the Chi-square values for interval two were based on the amount of crosscorrelation that occurred with a ten sec time span including the five seconds from the first lag interval, and Chi-square values for lag interval six were based on the amount of crosscorrelation that occurred between the mother and child within a 30 sec time span, including the 25 sec from the prior 5 lag intervals. Chi-square values of the crosscorrelation parameter estimates for each of these 6 lag intervals were calculated and served as dependent variables for comparisons between clinic and nonclinic groups, and between CDI and PDI within groups and across comparable assessment intervals. Separate time-series analyses were performed for each dyad in each experimental condition.

Chi-square values of child following in each lag interval represented how predictable the child's behavior was given antecedent mother behavior(s) occurring in the prior six, 5-sec, lag intervals (i.e., the prior 30 sec). Likewise,

Chi-square values of mother following represented how predictable the mother's behavior was given antecedent child behavior(s) occurring in the prior 30 seconds. Expected Chi-Square values increased linearly as a function of lag interval. This is because the number of parameters in the time series-models increases as the lag increases (as the search for pattern recedes back in time) which increases the degrees of freedom for the Chi-Square statistic. The expected Chi-square values for each lag interval were 11.07, 18.31, 25.00, 31.41, 37.65, and 43.77 for intervals 1 through 6 respectively. In the case of child following within a lag interval, Chi-square values exceeding the expected value for that interval indicated that the child was following the mother's antecedent behavior(s) at a level greater than would be expected by chance alone. With regard to mother following, Chi-square values exceeding the expected value for that interval indicated that the mother was following the child's antecedent behavior(s) at a level greater than would be expected by chance alone. Therefore, Chi-Square values larger than that expected by chance alone indicate patterning in the mother-child dyad, with increasingly greater values indicating increasingly patterned interactions. It is important to note that significant Chi-square values both indicate patterns of following and imply that the other person is leading the interaction. In statistical terms, leading and following are mutually implied. But this does not necessarily mean that the other person is intending to

lead the interaction. The important distinction to be made is between what is implied in the statistical definition of leading and following, and whether the person leading was intending to lead. During mother-infant interaction, the mother follows the infant's attentional and affective rhythms in the sense that her behavior is statistically dependent on the infant's past behavior, while the infant is considered to be leading the interaction because his or her behavior predicts subsequent maternal behavior. Most researchers, however, would be hesitant to conclude that the infant was intending to lead the interaction as this may be outside his or her developmental level. The statistical versus intentional interpretation of leading and following is less than clear cut, and in fact they can complement each other. In this study, the statistical definition and measure of leading and following was used in conjunction with the CDI-PDI experimental manipulation designed to control the mother's following and leading intentions.

CHAPTER III

RESULTS

Reliability of the DCS

Reliability measures should reflect closely the type of measures used in the study (Johnson & Bolstad, 1973; Gottman, 1979). This suggests that observational studies examining time-based patterns must calculate reliability by examining observer agreement at each point in time and by examining congruence in these patterns (Bakeman & Gottman, 1986). The present study examined sequential patterns through time in mother-child dyads. Consequently, observer agreement was assessed at a moment-by-moment level. Agreement coded in this way requires two considerations: (a) that the observers agree on the type of behavior (e.g., positive, negative, or neutral in the present case) and (b) when the behavior occurred. The first consideration is easily assessed by, for example, comparing the number of positive behaviors coded by the original and reliability observer. The question of interobserver agreement on when the behaviors occurred, however, is more difficult because of differences in videorecorder fidelity, observer reaction time, and individual differences in discrimination ability. In recognition of this fact, time-based observational studies

typically allow a "window" of variation for calculating reliability. Results from a previous study (Wruble et al., 1989) indicate that a two-second window (i.e., interval of variability) accounts for these problems without substantially inflating agreement. In the present study, then, an agreement was defined as the case when the original and reliability observer both recorded a behavioral change occurring within two seconds of each other. For cases in which two events occurred within the same two second interval, only one agreement was scored. For cases in which two or more events occurred within the two second interval, but only one of the events matched the other observer's coding, then one agreement and one disagreement were coded.

Three reliability scores will be presented for the DCS data: percentage agreement, percentage agreement controlling for chance agreement (i.e., Kappa), and Pearson Product Moment correlations.

Percent agreement is the most frequently used index of observer agreement. This index is simply the number of agreements divided by the sum of agreements plus disagreements. Although elegant in its simplicity, this index fails to account for the amount of agreement that could be obtained by chance alone. Failure to account for chance agreement can result in inflated agreement values. Kappa is considered a superior measure (Hollenbeck, 1978) because by controlling for chance agreement it provides a less biased estimate of agreement (Cohen, 1960).

Reliability was formally assessed at the beginning of the study and again just prior to the conclusion of the study. Informal reliability spots checks were also conducted with both specific and general feedback provided to the coders during a group research meeting. Fully one-third of the data was used for reliability calculations over these two assessment intervals.

Reliability was calculated by tallying agreement and disagreement for the natural shifts in mother and child behavior at each point in time. This procedure was conducted separately for the verbal and nonverbal data, for each condition (CDI and PDI), at pre- and post-treatment, and for the mother and child. Data were then combined across all experimental conditions resulting in a total of over 8600 behavioral changes. Only 8% of the behaviors were coded as either positive or negative and of these almost all were scored as positive. Overall, reliability uncorrected for chance agreement was moderate at 76% with an associated Kappa of .50. Fleiss (1981) has characterized Kappas of .40 to .60 as "fair." The reliability of the more specific codes of positive, negative, and neutral was similar at 74%, but with an unacceptably low Kappa of .22. This low Kappa value may be the result of low variability resulting from the fact that only 8% of the behaviors were coded as positive (8%) or negative (.0005%).

At the first reliability assessment, percent agreement for behavior changes was moderate at 79% with an associated

Kappa of .55, while at the second reliability assessment, percent agreement and Kappa were comparable at 77% and .53, respectively. At the first reliability assessment, percent agreement and Kappa for the more specific codes of positive, negative, and neutral codes were .75 and .28, respectively. But at the second assessment, percent agreement was .73, and Kappa was .53 which was substantially higher than at the first assessment. The subject data used for reliability purposes was balanced across all experimental variables. The probability of chance agreement for the first and second assessment intervals were .65 and .53, respectively. Furthermore, approximately the same number of behaviors were sampled at the first interval ($N=4205$) as at the second ($N=4336$) interval. Thus, the differences in the Kappa values between the two assessments is likely due to greater variability (i.e., a more equal distribution of behaviors across codes) in the interactions upon which the second reliability assessment was based.

Across both assessment intervals, changes in verbal behaviors were more reliable (Agreement= 80%, Kappa=.44) than changes in non-verbal behaviors (Agreement=70%, Kappa=-.06). The overall reliability of the activity referent behaviors was 64% (Kappa=.44). Percent agreement and Kappa values did not differ substantially as a function of group or person variables.

The inter-observer reliability of the Chi-square values were assessed by Pearson Product Moment correlations.

Significant inter-observer reliability was obtained for only the first three lag intervals of the child data (interval one: $r(32) = .49$, $p < .001$; interval two: $r(32) = .42$, $p < .02$; interval three: $r(32) = .42$; $p < .02$). The correlations for intervals four through six were not significant.

Interobserver reliability of the Chi-square values was not established for any of the lag intervals of the mother data. Hence, the DCS observers were unable to agree on the patterning of the mothers' behavior regardless of the time interval. Consequently, repeated measure ANOVAs using the mothers' data were not performed.

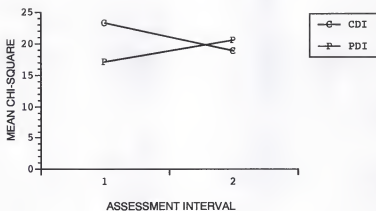
Dominance as discussed in this study referred to asymmetry in predictability between the mother and child during their dyadic interactions. Assessing dominance in this study, then, required both mother and child data. Unfortunately, limitations in the reliability of the mother's data did not allow a direct test of the dominance construct. Instead, this study evaluated the psychometric properties of a measure of child following. In discussing the results of this study the term dominance and child following are sometimes used interchangeably, to refer to the predictability between child behavior and antecedent mother behavior. Hence, in this study the term dominance is used more broadly.

Groups Comparison Results

The child data (see Appendix 4) were analyzed with three separate 2 X 2 X 2 (Group X Situation X Time) ANOVAs, with

repeated measures on the last two factors, and clinic versus nonclinic as the group variable. Dependent variables for these analyses were the Chi-Square values from the first three lag intervals, respectively. In lag interval three, a main effect for Time, $F(1, 22) = 6.54$, $p < .0179$, and a Group X Time interaction, $F(1, 22) = 4.54$, $p < .04$, were significant, but they were considered less important because a significant three-way interaction (Group X Situation X Time) was obtained, $F(1, 22) = 4.37$, $p < .0485$. A significant main effect for Time was also obtained in lag interval one, $F(1, 22) = 7.46$, $p < .0122$. This effect was not interpreted separately because Chi-Square values from latter lag intervals are based on earlier values; hence Chi-square values, and effects, from the third interval subsume those from the prior two intervals. The latter is the case because the time-series models for lag interval three may estimate child following more comprehensively than time-series models from the other two lag intervals, because the models assess child following over a larger interval of time. For purposes of clarity only effects from interval three will be presented.

In an effort to partial out the effects of the three-way interaction, a two-way ANOVA by Group--with Student Neuman Keuls post-hoc comparisons--was conducted using the child data from lag interval three. A significant Situation X Time interaction, $F(1, 22) = 4.79$, $p < .051$, was obtained for the clinic children. Figure 2 illustrates the Situation X Time



CLINIC CHILD FOLLOWING AS A FUNCTION OF SITUATION
AND ASSESSMENT INTERVAL

interaction found for the clinic children. In an effort to better understand this two-way interaction, a one-way ANOVA was performed. The prediction that the clinic children would follow their mothers less in CDI at post-treatment, as compared to pre-treatment, was confirmed, $F(1, 22) = 6.65, p < .018$. The prediction that clinic children would follow their parents more in PDI at post-treatment compared to pre-treatment was not, however, supported, $F(1, 22) = 1.30, ns$. No significant effects were observed for the non-referred children in CDI, $F(1, 22) = 3.86, ns$, or in PDI, $F(1, 22) = 2.47, ns$, between the two assessment intervals.

Clinic and nonclinic children were also predicted to exhibit different levels of following behavior, as a function of situation, within each assessment interval. The prediction that clinic children would follow more than nonclinic children in CDI at the first assessment interval was supported $t(22) = 2.52, p < .02$. The prediction that clinic children would follow less than nonreferred children in PDI at the first assessment interval was not supported, $t(22) = -.66, ns$. As predicted, the clinic and nonclinic children did not differ significantly in the amount of following at the second assessment interval in either CDI, $t(22) = -1.09, ns$, or PDI, $t(22) = -.76, ns$.

In summary, the DCS measure of child following in CDI was able to discriminate between clinic and nonclinic children at the first assessment interval, and was sensitive to treatment changes. The decrease in following behavior

from pre to post-treatment for clinic children indicates that PCIT had the effect of making the clinic children's behavior less dependent on antecedent maternal behavior in the CDI situation. This effect may indicate more flexibility in the mother-child interactive behavior patterns. The finding that clinic children followed less at post-treatment in CDI compared to the same situation at pre-treatment, whereas the non-referred children's following behavior did not differ significantly over the same assessment intervals suggests that child following is an important component of PCIT.

Validity of the Dominance Measure

Concurrent Validity

The concurrent validity of the child following was assessed by correlating the Chi-squares values with the ECBI Problem and Intensity scores. The mothers' data were not analyzed because of the reliability limitations noted previously.

Table 1 illustrates that at pre-treatment CDI for the clinic children, ECBI Intensity scores were significantly and positively correlated with child following at each of the three lag intervals (interval one, $\chi^2(12) = .70$, $p < .01$; interval two, $\chi^2(12) = .72$, $p < .01$; and interval three, $\chi^2(12) = .63$, $p < .05$), and with ECBI Problem scores for the first lag interval, $\chi^2(12) = .62$, $p < .01$. Table 1 also illustrates that the significant positive correlation between child following and ECBI scores for clinic children in CDI at pre-treatment were not evident for these children at post-

TABLE 1

CORRELATION BETWEEN CHI-SQUARE VALUES AND ECBI
SCORES FOR THE CLINIC CHILDREN IN CDI

PRE-TREATMENT
(N=12)

LAG		LAG INTERVAL			ECBI SCALE
INTERVAL	1	2	3	INTENSITY	PROBLEM
1		.87***	.765**	.70**	.62*
2			.81***	.72**	.54
3				.63*	.33

POSTTREATMENT
(N=12)

LAG		LAG INTERVAL			ECBI SCALE
INTERVAL	1	2	3	INTENSITY	PROBLEM
1		.67*	.63*	.09	.05
2			.87***	-.48	-.22
3				-.44	-.15

* p < .05

** p < .01

*** p < .001

treatment. ECBI scores and child following were not significantly correlated for non-referred children in CDI at comparable assessment intervals.

Convergent Validity

The convergent validity of the dominance measure was assessed by separately correlating the child following Chi-square values with the DIS ratings of child leading and following. Table 2 illustrates that the child following Chi-square values and the DIS ratings of leading and following for the children were not significantly correlated.

The concurrent validity of the DIS was assessed by correlating the DIS ratings of leading and following with the ECBI Problem and Intensity scores within each experimental condition. The results of these analyses failed to establish the concurrent validity of the DIS. DIS ratings of child or mother leading and following were not significantly correlated with ECBI Problem and Intensity scores in any experimental condition.

The inter-rater reliability of the DIS ratings was calculated on approximately one-half of the data. The inter-rater reliability of the DIS ratings of child leading was $\chi(41) = .55$, $p < .0002$, and the inter-rater reliability of child following was $\chi(41) = .38$, $p < .01$. Similarly, the inter-rater reliability of the DIS ratings of mother leading and mother following were $\chi(41) = .60$, $p < .0001$, and $\chi(41) = .62$, $p < .0001$, respectively.

TABLE 2

CORRELATION BETWEEN CHI-SQUARE VALUES
AND DIS RATINGS OF LEADING AND
FOLLOWING FOR MOTHER AND CHILD

	CHILD			MOTHER		
	Lag Interval			Lag Interval		
	1	2	3	1	2	3
CHILD						
LEAD	.087	.093	.097	.041	-.05	-.192
FOLLOW	-.06	.022	-.015.	.004	.082	.032
MOTHER						
LEAD	-.09	.011	-.013	-.062	.02	.022
FOLLOW	.125	.099	.080	.062	.001	-.124

Note: N = 96 non-independent observations.

The DIS ratings of child and mother leading and following were intercorrelated. The correlation between child lead and mother follow was high, positive, and significant $r(41) = .78, p < .0001$. Similarly, the correlation between child follow and mother lead was high, positive, and significant $r(41) = .82, p < .0001$. The correlation between child lead and child follow, and between child lead and mother lead were moderate, negative, and significant $r(41) = -.53, p < .0001$; and $r(41) = -.56, p < .0001$, respectively. The correlation between mother lead and mother follow lead were moderate, negative, and significant $r(41) = -.65, p < .0001$.

CHAPTER IV

DISCUSSION

This study provided a time-based observational measure of dominance, estimates of some of its psychometric properties, and some empirical support for the position that child following is an important component in PCIT.

Dominance Coding System (DCS)

A defining feature of any mother-child interaction is that it unfolds in time. The measure of mother and child sequential patterning used in this study captured this aspect of the process. The present observational measure of sequential patterning was based on coding discrete alternations in play behaviors and speech. This coding strategy had been used in a pilot study using a similar subject population and provided promising results (Wruble, et al., 1989). The DCS provided a first step toward assessing the patterns of leading and following that occurred in the mother-child play interactions and dialogue during two quasi-naturalistic clinical play situations.

Dominance was defined by asymmetries in predictability between the mother and child during interaction. The unreliable nature of the mother data precluded an assessment of dominance by limiting analyses to the predictability of

child behavior given prior mother behavior, but not vice versa.

One important limitation of the DCS coding system is that information about content (e.g., type of statement) and affect were not retained. These areas were not assessed mainly for pragmatic reasons. Initially, coders were trained to code both the content of each statement and each specific type of nonverbal behavior. Using the more detailed system, observers needed approximately 18 min of coding time per 1 min of parent-child interaction. The highly detailed coding system was streamlined early in the study by collapsing the specific verbal and nonverbal behaviors into the general categories of positive, negative, and neutral depending on the social impact of the behavior. The DCS coding system used in this study--composed of the three general categories of positive, negative, and neutral--only required approximately 6 to 12 min of coding time per min of parent-child interaction. Affect was not coded in this study for two reasons. First, a main emphasis of this study was to examine the psychometric properties of the measure of dominance developed by Wruble et al. (1989), which did not include affect variables. Second, adding affect codes to the DCS would have made the coding system prohibitively time consuming.

Another limitation of the DCS is that it lacked information about the continuous change in affective intensity and attentional involvement over the course of the

interaction. Consequently, valuable information about the level of affective and attentional involvement between the mothers and children was unavailable. The affective patterning in the parent-child relationship seems especially important given that PCIT facilitates the development of a warm, positive, and genuine parent-child relationship, and because PCIT teaches parents to control their child's behavior by using differential social attention. It is likely that a measure that captures the continuous ebb and flow of affective and attentional involvement during mother-child interaction would provide a more direct assessment of the quality of the relationship in general and the quantity of dominance in particular. This type of coding strategy is not without historical precedent. In their study of synchrony (i.e., dominance) in parent-infant interaction, Tronick et al., (1977) were the first to convert specific behaviors into values along a univariate scale of involvement. Gottman (1979) later used the same univariate scaling strategy in his study of dominance in marital interaction. Converting DPICS and nonverbal behavior codes into univariate scale values could easily be accomplished by intuitively or empirically scaling these behaviors along a predetermined scale (e.g., attentional involvement). The resulting time-series could then be analyzed using the semi-automated statistical packages developed and used in the present study.

The DCS is not practical for everyday clinical use because of the large investment in coding time and data analysis necessary to obtain a measure of leading and following. PCIT researchers are likely to profit from correlating frequency measures of leading and following with process measures of the same. If high correlations are obtained then researchers and clinicians could be more confident in their use of frequency measures as estimates of leading and following to assess clinic versus nonclinic status and treatment changes.

Psychometric Properties of the Dominance Measure

A major emphasis of this study was to assess the psychometric properties of the DCS dominance measure. This is the first social interaction study in general, and PCIT study in particular, to assess the reliability and validity of a time-based observational measure of social interaction and dominance, respectively.

Parent-infant research has implicated social leading and following as important to the development of social competence. These studies have, however, been based on anecdotal reports or small samples, and have used inadequate statistical methods to assess leading and following. Additionally, with the exception of Gottman's (1979) marital interaction research, the dominance construct has been poorly defined and researched. Finally, the reliability and the multi-method tests of the validity of dominance measures have not been previously reported in any literature.

Leading and following has also been considered important to the effectiveness of PCIT. Likewise, prior to the present study PCIT research had not defined, measured, or examined the leading and following process. Consequently, prior to the present study there was no empirical support for the assumption that leading and following is important in the development of social competence in general, or to the effectiveness of PCIT in particular.

Inter-observer reliability

Inter-observer agreement corrected and uncorrected for chance was significant for the mothers' data. The reliability of the mothers' Chi-square values, however, was nonsignificant. These results taken together indicate that the observers often agreed on the overall rate or frequency of the mothers' behaviors, but were unable to agree on the timing and patterning of the mothers' behaviors.

The present study highlighted one limitation of using the Kappa measure to assess sequential patterning which is that Kappa values are based on agreement within time as opposed to concordance in patterning across time. For instance, consider the following contrived sequences of mother-child interaction (where M=mother, C=Child, and the a=positive, b=negative, and c=neutral subscripts represent the type of behavior change):

Observer 1:

M_a	M_b	M_a	M_b	M_c
C_a	C_b	C_a	C_b	C_c
Time 1	5	10	15	20

Observer 2:

M_a	M_b	M_a	M_b	M_c
C_a	C_b	C_a	C_b	C_c
Time 1	5	10	15	20

Both observers coded the same number (5 each for mother and child) and types of behavior (i.e., positive, negative, or neutral). Using a conventional two-second window they were in perfect agreement. It is clear however, that the observers were in complete disagreement about who was leading the interaction. The data generated by the first observer seems to suggest that the child is leading the interaction, while the opposite is true for the second observer. If these time-series were extended out and analyzed for dominance patterns, what would be expected? With regard to the child data it would be expected that the resulting Chi-square value for the first lag interval from the first observer's time-series would be low (e.g., 3.00) because the child seems to be leading. The comparable Chi-square value from the second observer's time-series would be high (e.g., 10.00) because the child seems to be following the mother's lead! What this

example demonstrates is that the reliability of the sequential patterning between the mother and child's behavior is likely better estimated by the correlation between the sequential patterning measures (i.e., Chi-square values of the crosscorrelation parameters generated from the original and reliability observer's time-series models).

This is the first study to calculate the reliability of the sequential patterning measures themselves. The results are quite sobering. Inter-observer agreement, Kappa, and the reliability of the Chi-squares values of sequential patterning were consistent only for the first three lag intervals of the children's data. This suggests that the coders agreed on the patterning of the children's behavior with respect to the mothers' antecedent behavior within any 15-sec period, but not thereafter.

The inter-observer reliability of the Chi-Square values obtained for the children's data were lower than are typically considered acceptable using the standards developed from questionnaire data. The DCS inter-rater reliability measures obtained in this study were tentatively treated as acceptable pending the establishment of reliability standards for time-based sequential data, and because the DCS measure was both robust enough to discriminate between clinic and nonreferred children in CDI at pre-treatment and was sensitive to treatment changes in the clinic children's following behavior.

The reliability of observational measures is thought to be influenced by a number of factors including the complexity of the interaction and the complexity of the coding system used to assess the interaction (Bakeman & Gottman, 1986; Reid, Skinrud, Taplin, & Jones, 1973). Observers using time-based observational coding systems must agree not only on the total frequency of behaviors, but face the the additional challenge of having to agree on the sequential patterning of these behaviors. As indicated previously even slight variations between observers in coding sequences can have dramatic effects on the reliability of their observations.

The results of this study indicate that one cannot assume that agreement in frequency means agreement in sequential patterning. The discordance between the frequency (i.e., percent agreement and Kappa) and pattern measures of reliability observed for the mothers' data in this study strongly suggests that social interaction researchers use multiple methods to assess empirically the reliability of their measures of patterning. In particular, the inter-observer reliability of sequence measures should be assessed during observer training, and each time reliability is evaluated formally. The former would facilitate providing specific feedback to the coders regarding the reliability of their discriminations of the sequencing of the interaction, while the former would allow for evaluation of changes in the observer's sequential reliability over the course of the study (i.e., observer drift or decay).

One explanation as to why the children's and mother's patterning data were reliable and unreliable, respectively, is that the child's behavior may have been easier to code. Verbal and nonverbal inter-observer reliability was extremely similar for the mother and child data. Comments made by the observers, however, suggest that the mothers' behavior changes may have been more difficult to code, perhaps because adult behavior is more subtle. For instance, maternal transitions in play often take the form of complex sequences in which the mother watches the child, comments, watches something else, or gazes at the toys with which the child is playing. Sequences such as these were consistently difficult to code given the camera angle and the uncertainty as to where the mother's attention was focused. Decision rules were developed to bring some order to these situations, but scoring often required the informed judgement of the coder. Children, on the other hand, would typically make distinct transitions from playing to watching, or from playing with one toy to playing with another toy. In contrast to the DCS, the inter-observer reliabilities obtained for the DIS were considered unacceptable by conventional standards.

Validity of the DCS

Concurrent Validity. ECBI Intensity scores were positively related to the DCS measure of child following only for the clinic children at pre-treatment CDI. At this assessment interval, significant positive correlations between ECBI Intensity scores and child following were found at all three

lag intervals, and a significant positive correlation was found between ECBI Problem scores and child following, but only in the first lag interval. No significant correlations were observed between child following and ECBI Intensity or Problem scores for the clinic children in CDI at post-treatment, or for the non-referred children at comparable CDI assessment intervals. This pattern of results indicates that for conduct problem children, child following is related to the frequency of conduct problem behaviors. As mentioned previously, clinic observations and research indicate that mothers of children with conduct problem behaviors have difficulty following their children during clinical play interactions which is often manifest by the mother's leading the interaction when they should be following. Before beginning CDI, the mothers were instructed to let the child choose any activity, to follow the child's lead, and to play along with the child according to the child's rules. Mothers' reasons for not following the child in his/her game, are likely numerous, varied, and could include not understanding the task, not knowing how to follow the child (i.e., a social competence deficit), or refusing to cooperate even though the mother is socially competent, perhaps because the mother refuses to "spoil the child," or "to let the child have his/her way." The interpretation of the relation between child following and ECBI Intensity scores for the clinic dyads in CDI would be clarified by knowing the relation between mother following and ECBI scores in CDI at

pre- and post-treatment. Unfortunately, limitations in the reliability of the mother's following data precluded knowing if, and how, the mother's following behavior in CDI at pre- and post-treatment was related to ECBI scores.

Competent social following is probably related to dimensions having to do with the quality of the mother-child relationship. These include, but are not limited to, effective listening and responsiveness, sensitivity, feeling "connected," emotionally close or "in synch," as well as perceptions about who's directing the interaction (i.e., who's in charge) and how much the person following trusts and is comfortable following the other person's lead.

Convergent Validity

DIS. The results of this study suggest that the DIS has poor psychometric properties. In addition to exhibiting poor inter-observer reliability, the concurrent validity of the DIS with the ECBI was not established⁵, and the DIS was found to be an inadequate measure for evaluating the convergent validity of the DCS measure of leading and following.

The pattern of moderate, negative and significant intercorrelations between child-lead and mother-follow, and vice versa, on the DIS suggest that the observers tended to rate leading and following within a person, and between interactants, as being opposing tendencies. For instance, if

⁵ An intra-class correlation test would have been more appropriate, but was not conducted because near zero correlations were found using even this more liberal analysis.

the child was rated as leading then the child would also be likely to be rated as not following the mother, and the mother would be rated as following but not leading the child. Taken together these results indicate that the raters tended to pair child following with mother leading and vice versa, and that they had some difficulty agreeing on these ratings. This indicates a logical, simplistic, and seemingly invalid approach to coding leading and following. Assuming that the DSC measure quantifies, at least partly, the dominance process between mother and child, then the DIS ratings appear to assess the raters' biases more than mother-child leading and following behaviors. The DIS ratings reflect the raters' tendency to rate leading and following as opposite tendencies as compared with behavioral sequences that establish leading and following.

Apparently, the DCS and the DIS measures assessed entirely different behaviors or processes. The lack of a relationship between the DIS and the ECBI scales indicates that it is unlikely that the ratings were based on disruptive behaviors. At this point it is unclear what behaviors the DIS raters were using in forming their judgements. This may have resulted because they received insufficient instructions (see Appendix 2). They were simply asked to rate child and mother leading and following without being informed about what behaviors to use in their judgements. This was done with the intent of keeping the raters blind to the experimental conditions, and also to avoid biasing their

ratings. The latter reason is precisely why PCIT clinicians were not used. The raters were first year graduate students who were familiar enough with PCIT to know the difference between CDI and PDI but had never coded using DPICS or served as a PCIT therapist. It was felt that if raters knew what behaviors were thought to indicate leading and following and how these relate to CDI and PDI, that their ratings of leading and following might be influenced by what they thought should be happening in the situation (e.g., the mother should be following in CDI).

PCIT researchers who are interested in developing rating measures of leading and following are advised to think through these issues carefully and exert more experimental control over the type of information given to the raters. Preferably, future rating scales will be based on empirical studies that have identified the interactive behaviors that establish patterns of leading and following.

Discriminant Validity

Groups Comparison Results. Repeated measures ANOVAs of the DCS showed that clinic children followed their mothers less in CDI at post-treatment compared to pre-treatment. This result was consistent with predictions for clinic children in CDI. It was expected that clinic children would follow their mothers less in CDI after treatment because clinic mothers in CDI pre-treatment often lead the interaction even though they have been instructed to follow the child in play. Consequently, prior to treatment the clinic children are

often coerced into following as a result of their mothers' attempts to lead. PCIT coaches mothers in effective and satisfying leading and following interaction patterns.

Support was not provided for the prediction that clinic children would follow more in PDI at post-treatment compared to pre-treatment. After further reflection, perhaps this result is not too surprising. As detailed previously, during the PDI phase of PCIT, clinic-referred parents are coached to alternate between leading and following. For instance, parents are always instructed to introduce commands within the context of a warm, genuine interaction in order to facilitate child compliance. Moreover, clinical experience suggests that over the course of treatment parents often seem to feel more comfortable following their children, perhaps because their attempts are more effective, and because it makes them feel emotionally closer to their child. In other words, the parent's use of non-directive techniques promotes a secure relationship, and provides a context for change in the parent-child relationship. This type of parent-child relationship facilitates more effective parent management of the child's behavior, and provides a supportive, nurturant, and safe relationship within which the child can become more socially competent and self-managed. At post-treatment assessment, then, PDI may have a different meaning and demand characteristics for clinic parents: PDI may come to mean alternating between leading and following as opposed to feeling that they always have to be in the lead. It is

likely that at post-treatment clinic-referred mothers focus relatively more on the following than the leading component of PDI in guiding their children's interactions. The prediction that clinic children would follow more at post-treatment PDI compared to pre-treatment assumed that the mother would lead more at post-treatment and would be more effective in her attempts. In fact, the clinic mothers may have actually led less at post-treatment than at pre-treatment for the reasons outlined above, resulting in less dependent and more self-managed child behavior.

In any event, PCIT appears to have the effect of making the clinic children's behavior less dependent on their mothers' antecedent behavior, suggesting that the children's behavior becomes more self-managed as a result of treatment. This interpretation is buttressed by the significant between-group differences in ECBI Intensity, $t(22) = 12.08$, $p < .0001$, and Problem scores, $t(22) = 12.33$, $p < .0001$, at pre-treatment, but the groups did not differ significantly at post-treatment on either ECBI Intensity scores, $t(22) = -1.77$, ns, or ECBI Problem scores, $t(22) = -.077$, ns.

The DCS was able to discriminate between conduct problem children and comparison group children in CDI at the first assessment interval on the measure of child following, and the DCS was sensitive to treatment changes in child following for the clinic children in the CDI situation, despite the high variability of the DCS and a relatively small sample size. The fact that the two groups of children differed on

the DCS measure of following at the first assessment interval in CDI, but not at the second CDI assessment interval, suggests that patterns of leading and following are indicative of the functional status of the mother-child dyad, and that PCIT may function to restructure the dyadic patterns of leading and following in CDI. The support for the discriminant validity of the DCS provided by this study also indicates that the DCS has the potential to improve clinic-nonclinic classifications, and to provide a measure of treatment outcome for the CDI component.

Special Considerations in PCIT Interaction Research

Conducting research, especially interaction research, with the PCIT population requires attending to the special needs of the population as it interacts within the quasi-naturalistic clinical setting. Analog interaction measures require continuous monitoring and assessment of the mother-child interactive behaviors and processes. This presents a problem. In an effort to facilitate naturalistic and spontaneous interaction, the clinical play situations place few constraints on the mother's or child's behavior during each situation. As a result, children often wander, explore, lie down, or even run about the playroom. Capturing this complex behavior on videotape with preschoolers is a formidable task, which has not been encountered by researchers who have analyzed dominance patterns in dyads whose movement could be restricted during relatively naturalistic interactions. Mother-infant interaction

researchers were able to code face-to-face interaction by strapping the infant in an infant seat fixed to a table, similar to a normal feeding situation. Gottman (1979) was able to restrict the movement of the married couples that he studied by seating them across from each other during conversation or by having them communicate through a "talk table." These methods do not seem appropriate for studying the interactions between conduct problem children and their mothers mainly because restricting the child's movement during mother-child interactions compromises the generalizability of the results to more naturalistic settings. Coding mother-child interactions is also difficult from videotapes in which only one camera was used because there are many times when it is impossible to observe the mother and child simultaneously. Advances in video technology such as small remote controlled cameras, video laser discs, and advances in observational methodology including digital images and on-line computer coding systems may attenuate some of these problems.

Overview of Parent-Child Interactions

Competent parent-child interactions occur when the child is able to signal his status and needs effectively and to respond effectively to parental interventions, and when the parent is able to interpret the child's status and needs so as to respond effectively with the right behavior at the right time in the right intensity. The ability to coordinate interpersonal behaviors presupposes being able to

discriminate deviant from prosocial behaviors, being sensitive to the status and needs of the other person, being able to control one's own behavior effectively, and, on the parent's part being able to differentiate between responding to the child's immediate behavior instead of unrelated and unresolved distal interpersonal behavior.

Interactional processes are probably best viewed as existing on a continuum extending from uninvolved (whereby each member's behavior is not predictable from the other's) to involved (whereby each member's behavior is predictably interrelated). The level of involvement corresponds to how well the dyad negotiates the difficult task of balancing intrapersonal and interpersonal factors. Effective social functioning requires managing both a self-regulatory component and an interactive component (Patterson, 1982; Thomas & Martin, 1976). Walcher and Peters (1971) suggested that play activities help develop intrapersonal and interpersonal coordination through trial and error experience. The functional status of any interaction is related to the confluence and interplay of the self-regulatory component and the interactive component. Walcher and Peters (1976) state that:

Regulatory systems are found on all levels of the organism's functioning Each self-regulatory system presupposes the existence of several types of feedback resulting from the interaction of the child and the environment and from changes in the environment. One type of feedback results from the coordination of the individual's general activities. The other results from the progressive differentiation between the

individual's activities and the objects in his environment (pp. 8-9).

According to this view, PCIT may help the parent to manage his/her own behavior which has the effect of not only increasing the parent's ability to manage the child, but also has the effect of helping the child to more effectively self-manage his/her own behavior. The importance of the ability of the parent and child to engage in both coordinated and independent activities cannot be overstated. Gottman (1979) cited family systems and dyadic interaction research which reported that functional and dysfunctional interactions could be distinguished by the degree of predictability in the interactions. Functional systems are distinguished by their ability to respond in a flexible and creative manner in the face of changing circumstances (von Bertalanffy, 1968), and are able to alternate between coordinated and independent activities. Dysfunctional systems, by contrast, are often rigidly patterned, may have difficulties alternating between coordinated and independent activities, and demonstrate difficulties differentiating from each other which allows disturbances in one component of the system to spill over into other areas of the system. For instance, Wahler and Dumas (1989) have found evidence that negative parent-child interactions are predicted from the parent's prior negative interactions with intimates (e.g., mother, husband) and people in the community. The inability of the parent of a child with conduct problem behaviors to differentiate his/her

feelings left over from prior negative interactions from his/her feelings and perceptions about the child in the immediate interaction suggests that self-management deficits create or exacerbate unsatisfying or coercive parent-child interactions.

The results of this study suggest that PCIT may promote the development of more functional parent and child self-management patterns as well as more functional mother-child interaction patterns. Perhaps, the most important result of this study is that it provides empirical support for the previously untested assumption that child following is an important component of PCIT.

Epilogue

Dominance is thought to be essential to effective communication. Dominance means being able to use the right behavior pattern(s) at the right time in the right intensity. In other words it is a matching phenomena. Dominance is important to PCIT therapists given the fundamental role of parent-child communication in establishing, maintaining, and terminating functional parent-child relationships. The interrelations between the dominance dimensions of type, timing, and intensity need to be assessed systematically in any complete account of the parent-child interaction process.

PCIT clinicians cannot be content with well-worn metaphors such as "harmony", warmth, "being in synch", etc., as descriptions of parent-child interactions in general, or parent-child dominance in particular. Moreover, PCIT

researchers need valid and reliable measures of the process aspects of the parent-child relationship. Specifically, PCIT clinicians and researchers need to know the behaviors and interactional patterns involved in parent-child dominance, how to change dysfunctional patterns of dominance, and how dominance relates to parent-child and personal adjustment.

Other natural sciences have advanced only after the requisite descriptive groundwork has been laid (Braitenberg, 1984; Glass, Wilson, & Gottman, 1975; Gottman, 1976; Gottman, 1979, Kantor, 1959; Ray & Delprato, 1988) emphasizing the fact that "direct observation is the methodological cornerstone of the natural sciences" (Hartup, 1979, p. 11). Working from descriptive data to formal model building is the method of the natural sciences. Gottman (1979) has suggested that theorizing should mean explaining patterns in well-described phenomena and that "the behavioral sciences have suffered from the neglect of the descriptive phase of scientific investigation" (p. 292). He issues a call for detailed descriptive research in the study of social interaction and suggests that investigation proceed in four phases: description and discovery of pattern, parsimonious model building, predictive testing of the model and intervention studies, and understanding the model (theory building). Descriptive research on parent-child interactions is still in the early stages of this investigation sequence. The present study provided some of the initial groundwork in this process.

APPENDIX 1

DOMINANCE CODING SYSTEM (DCS)

Marc K. Wruble

Version 3
1/23/90

This coding system is designed to provide information on the patterning of mother-child interactions in two relatively unstructured clinical play situations. This coding system is a descendent of a more comprehensive coding system (Wruble, Sorensen, Sheeber, & Eyberg, 1987) designed to detail the structural, functional, and operational characteristics of mother-child interactions during three standard clinical play situations varying in the amount of parental control required. The present system attempts to capture the overall quality (positive, negative, neutral) and patterning of mother-child interactions.

Coders are instructed to perform three general tasks. First, they are asked to capture the time of each verbal or nonverbal behavior. Verbal behaviors are coded at the end of each verbalization with the exception of 'duration relevant' verbalizations such as crying, yelling, play talk, and singing which are coded for the entire time they occur. Nonverbal behaviors are coded at the beginning of the change to a different nonverbal behavior and or the referent for a behavior. This process is detailed in the nonverbal section.

Subject ID:

M = mother

C = Child

General Rules for coding nonverbal behaviors.

Both domains are coded at the beginning (time=000) of each condition. However, after that initial coding, a domain is only coded when there is a change in at least one domain. There is a 1 second resolution; a behavior or event must last for 1 second to be coded, except for hitting, kicking,

grabbing, kissing, head nod or head shake, take, give, rearrange/block, and tear up. A state change is coded for the activity domain at the time when the person touches an object (i.e., transitions are considered part of the previous activity). The referent of an activity is coded under two conditions; when there is a change in the activity referent domain itself (e.g., a change from playing with blocks to playing with the castle figures), or when there is a change in the activity and the referent also changes (e.g., from playing with blocks to watching mother).

If person is engaged in two or more play activities concurrently, then code the activity which is the most active (e.g., if the child is holding a toy in one hand and manipulating another toy with the other hand, then code manipulating).

Only code activities that are relevant to play. For instance, moving furniture would not be coded.

When there is a question about when a nonverbal activity changes (e.g., when a child picks up a toy slowly and then builds) code at the start of the activity (i.e., at the picking up). This is consistent with the way that 'Giving' is coded.

Fidgeting is defined as any repetitive/stereotyped movements with the hand(s) that occurs when the person is attending to something other than their hands or the objects in them. Therefore, fidgeting is not coded as play activity.

Manipulating is defined as attending to and moving one or more objects in a dynamic, i.e., non-stereotyped manner.

Non-verbal behaviors are coded as either positive, negative, or neutral.

9 = unidentifiable If in any domain the coder cannot see the subject to identify the proper code, use 9. However, that domain must be coded the second that it is identifiable.

Neutral non-verbal behaviors are coded "0" and include:

HD = holding

Supporting the weight of an object, most frequently a person, using the hand(s) or arm(s). Holding does not include hugging, grasping, or restraining, and it is not coded when the activity is part of play.

BU = building

Manipulation of construction toys (e.g., blocks, straws, legos).

Building includes taking the toys from containers as well as the construction of some thing.

HN = head nod (yes)

Only code when the person is not actively engaged in another activity at the same time. Therefore, only code during watching.

HS = head shake (no)

Only code when the person is not actively engaged in another activity at the same time. Therefore, only code during watching.

PL = pulling/pushing

Moving an object or person towards or away from the person who is pulling/pushing. Do not code pulling/pushing as part of play. Grabbing is coded when the grasping is sudden and/or forcible.

WT = watching

When a person is engaged in no other activity than looking at an object or person. If the face cannot be seen, code 9 as referent (except when the person is scanning, then code other as referent). If it is unclear whether the person is watching a object or a person manipulating the object, code the person as referent.

PS = pointing/showing/

Enabling another person to see gesturing or directing attention towards an object, direction, or place (for example pointing with a finger or holding an object for someone to see). Do not code holding as part of this activity. Also includes gesturing (using the hands to indicate a quantity or amount and waving) when there is no other concurrent activity. The referent for gesturing is always coded 9.

Additional information:

Point/Show/Gestures can be continuous or discrete; i.e., it does not have to last for one second.

DW = drawing

Application of a writing instrument on a surface. Drawing includes scribbling, writing, or drawing a

picture. It also includes picking up and moving the instruments of writing, paper and pencils for example.

CU = clean up

To take something apart by gradual means. Includes placing materials into containers (i.e., cleaning up). Only code when the participants are obviously ending play with that toy and they are putting them away, or when one or more of the participants are picking up a play object from the floor.

BG = Board Games

Any manipulation of the board game itself, it's pieces, or it's container within play. Board Game must last for one-second.

Decision Rules for Board Games:

- 1.) If person is resting hand on board and alternatively pushing or otherwise manipulating objects then code as board game.
- 2.) If a person is contacting surface code Board Game, whereas if not code change to either Point Show or Watching.
- 3.) If unsure whether person has changed activities do not code as a change in activity.
- 4.) With alphabet teacher code Point Show if pointing above game; if teaching board/manipulating code Board Game.

FP = fantasy play

Imitating human and/or animal behaviors, typically using dolls or figurines. This code includes picking up and moving objects during play and when arranging the toys.

ER = erasing

Rubbing or crossing out something tangible (e.g. pencil or chalk writing). Crossing out includes scratching out or putting an X through something.

RB = rearrange

This includes rearranging things on the other person's construction or clean up, and rearranging the other person's addition to the actor's construction or clean up. This also includes erasing the other person's drawing (if whole drawing is destroyed, code tear-up/break.) All rearranges must occur within 2

seconds of other person making the construction.

Decision Rules:

- 1.) Transitions from rearrange to building is not coded as a change.

Negative non-verbal behaviors are coded "-" and include:

Whenever a negative nonverbal behavior occurs code whether the other person responds to or ignores the nonverbal behavior.

Responds to negative = consists of any verbal or nonverbal reaction by the other person following smart talk, whine, cry, or yell. Examples include laughs, frowns, smiles, grimaces, winces, rolls eyes, sighs, maintains or establishes eye contact, warns other person, criticism, taking object from other person, asks for rationale, etc (see p. 79 of DPICS manual for additional examples).

Ignores negative = the other person remains silent, maintains a neutral facial expression, avoids or breaks eye contact, makes no movement in response except to turn away (see p. 81 of DPICS manual for examples).

BK = Blocking

Includes blocking the other person from playing or cleaning up.

Decision Rules:

- 1.) Transitions from blocking to playing are coded as changes.

FG = flailing (of arms and/or legs)

Repeated gross arm/leg a flailing manner without making contact with another object. This can occur in any posture.

HT = hitting

Applying undue force towards an object or person using the hand with short duration (<1 sec) without grasping. This does not include rubbing, patting, or kicking. It does include slapping, punching, pounding, and striking. Does not require contact with the person or object and may occur in rapid succession.

RN = restraining	Actively restricting the movement of any or all parts of the other person's body with that person actively resisting the restraint. Holding is not coded as part of restraining.
TH = throwing	Projecting or propelling an object through the air by a swift motion of the arm(s). Do not code as part of play. If object is thrown at other person, code as hitting other person.
GR = grabbing	Actively taking hold of/seizing an object suddenly and/or forcibly. Pulling/pushing is not coded as part of grabbing. Includes taking hold of an object that is part of the other persons construction or that is presently in use by the other person. Note: grabbing is coded even if object is not actually obtained. If a subject knocks down or tears up an object while grabbing, only code grab.
KK = kicking	Applying undue force towards an object or person using the feet or knees.
TU = tear up/break	To separate an object into parts by ripping, tearing, or breaking, or to crush an object by stepping on it or smashing it between the hands. Also include knocking down something.
TK = take	To seize an object from the other person's possession.
Decision Rule:	
1.) If unsure whether to code 'Take' or not, do not code 'take'.	
NO = NO	Only coded when there is (1) a nonverbal gesture with one or more of the hands indicating

'No' or 'Stop', and (2) verbalizations indicating 'No', 'Stop', or 'Don't'. This gesture often consists of waving the hand(s) in a side-to-side motion with palm(s) of hand facing toward the person.

Positive nonverbal behaviors are coded "+" and include:

CA = caressing	Gentle rhythmic stroking or patting of an object with any part of the body. This also includes hair ruffling and tickling.
CP = clapping	to strike the hands together repeatedly usually to applaud either another person or oneself
KS = kissing	Touching an object with the lips or a puckering gesture of the lips towards an object.
HG = hugging	One or both arms folded around object with torsos at least nearly in contact.
TC = touching	Physical contact of hand with other person. Touching does not include hitting, grasping, patting, or any activity that includes the contact of the hand with anything other than a person.
GV = giving	Placing an object in the hand of, or in front of the other person (when verbalizations indicate the other person is commanded to make use of the object). The actor must physically move or hold the object (else code point/show/gesture.) When it is unclear whether GV or PS, code PS.

Object of Activity (Referent)

CB = cabinet
 FL = floor
 CH = chair
 PT = parent
 TB = table
 OA = other
 CK = chalkboard
 DO = door
 MI = mirror
 CI = child
 AI = air when action is done towards someone
 T1-T8 = toys:
 T1 = Lincoln Logs
 T2 = Alphabet Teacher
 T3 = Magnetic Letters & Board
 T4 = Baby Blocks
 T5 = Magneto Blocks
 T6 = Tinker Toys
 T7 = Legos
 T8 = Constructo Straws
 9 = unknown, unclear, ambiguous object, or obstructed from sight.

Decision Rules:

- 1.) If two people have possession of an object simultaneously then code the referent of the activity as the other person.
- 2.) When a person changes from one toy (e.g., castle) to another toy (e.g., blocks) then incorporates this 'new' toy into the 'old' toy code as follows:
 - (a) code as change from toy 1 to toy 2, and
 - (b) only code change from playing with incorporated toy 'toy 1' to next change in referent (e.g., watching). That is, only code two changes.

Verbalizations

Three rules for coding separate verbalizations. These rules are meant to be used in combination to determine the number of distinct statements (i.e., thought units) present in any verbalization.

Separated by > 1 sec.?

- a). If so, then likely code as two separate statements.
- b). If not, then likely code as one statement.

Is statement a complete thought?

- a). If so, then likely code as one statement.
- b). If not, then likely code as two or more statements.

What would statement look like grammatically?

- a). Punctuation typically indicates separate thoughts.

BASIC RULE FOR VERBALIZATIONS: Code the literal meaning of the statement.

Other important Rules:

Acknowledgements occurring at the beginning or end of a sentence are coded as part of the sentence. That is, they are not considered to be a separate thought apart from the sentence. For instance, 'O.K., Now put the blue block on top of the red one.' would be coded as one complete thought, not two.

There are two types of verbalizations:

- a). Discrete - consist of distinguishable sentences, phrases, or utterances. The times for these verbalizations are coded at the end of the verbalization.
- b). Duration Relevant - consist of utterances which may or may not have content. These statements include yell, cry, play talk, laughing, singing, etc. The times for these types of verbalizations are coded at the beginning and end of the utterance.

Neutral verbalizations are coded "0" and include:

DC = direct command

A clearly stated order, demand, or direction (i.e. telling the person what to do) in declarative form. The statement must be sufficiently specific as to indicate the behavior that is expected from the other person (can include a vague command with nonverbal demonstration).

EXAMPLES:

Put that block here.
Please tie your shoe.

IC = indirect command

An order, demand, or direction (i.e. telling the person what to do) for a behavioral response that is nonspecific or implies choice on the part of the other person.

IV = irrelevant verbalization

A comment or question made by the parent (all child verbalizations are relevant) that pertains to an event, verbalization, individual, or object that is unrelated to the ongoing activity of the parent or child. Continued discussion or elaboration on a topic brought up by the other person is not coded irrelevant verbalization.

NW = No Words

Used in circumstances where there is not manifest content but there are vocalizations, e.g., laughing. This is differentiated from '9' codes by the fact that the "no words" code is used for instances in which there is no manifest content whereas the '9' code is used in instances where there is content but it is not discernible.

AK = acknowledgement

A brief verbal response to the other person's verbalization or behavior that contains no manifest content other than a simple yes or no response to a question.

EXAMPLES:

Alright
There you go.
O.K.

IS = incomplete sentence

Whenever a subject makes an incomplete statement or is interrupted before completion. Specifically, when a person interrupts themselves or

changes content to such an extent that a scoreable sentence was not spoken.

DS = descriptive

A declarative sentence or phrase that gives an account of the objects or people in the situation or the activity occurring during the interaction. It must be evaluatively neutral of the person, product or activity.

RF = reflective

A declarative phrase or statement which immediately repeats the other person's verbalization. The reflection may be exactly the same words the other person said, may contain synonymous words, or may contain some elaboration upon the other person's statement, but the basic content must be the same as the other person's message.

EXAMPLES:

Child: The pig is fat.

Parent: The pig IS fat.

Child: Give me the car.

Parent: You want the car.

DR = descriptive/
reflective

A descriptive or reflective comment expressed in question form. Descriptive/reflective questions follow the other person's activity rather than attempt to lead it.

PT = play talk

Any utterance which replicates the sound of the object used in play. Play Talk is generally characterized by a high pitch, and it includes imitations of voices, machine sounds, and animal sounds.

SG = Singing

Positive verbalizations are coded "+" and include:

LP = labeled praise

Any specific verbalization that expresses a favorable

judgment upon an activity, product, or attribute of the other person.

EXAMPLES:

Your picture is very pretty.
That's a terrific house you made!

UP = unlabeled praise

A nonspecific verbalization that expresses a favorable judgment on an activity, product, or attribute of the other person.

LA=Laughing

Staccato, inarticulate utterances characterized by expulsion of air, including chuckling, smiling, or explosive sounds. Also includes any other tone typically perceived as pleasant.

Negative verbalizations are coded "-" and include:

Whenever a negative verbalizations occurs code whether the other person responds to or ignores the verbalization.

Responds to negative = consists of any verbal or nonverbal reaction by the other person following smart talk, whine, cry, or yell. Examples include laughs, frowns, smiles, grimaces, winces, rolls eyes, sighs, maintains or establishes eye contact, warns other person, criticism, taking object from other person, asks for rationale, etc (see p. 79 of DPICS manual for additional examples).

Ignores negative = the other person remains silent, maintains a neutral facial expression, avoids or breaks eye contact, makes no movement in response except to turn away (see p. 81 of DPICS manual for examples).

CS = critical statement

A verbalization that finds fault with an activity, product, or attribute. It includes SARCASM, SWEARING, and NEGATIVE COMMANDS [which is defined as an order, demand, or direction to cease a current behavior or to not begin some activity (i.e. tells the person what not to

ST = Smart Talk

do)). The behavior does not have to be specified.

Impudent or disrespectful speech by the child which includes:

Counter command = A paraphrase or identical restatement of a command given by the other person with the same referent. Counter command implies that the behavior was not completed within the time required to code compliance.

Refusal = A statement or question indicating that one is unwilling to comply with a command. Do not code refusal if the command is repeated as part of the refusal.

Example:

No!

Forget it!

I'm not going to do it!

I don't want to!

Stating an alternative action is not a refusal unless preceded by a statement indicating they will not comply with the statement/command.

Examples:

No. I'm going to build a tower.

CR=Cry

Inarticulate utterance of distress at or below the loudness of normal conversation.

YE=Yell

Loud screech, scream, shout, or loud crying, above normal, conversational volume which does not express approval.

WH=Whine

A slurring, nasal, high-pitched, falsetto voice whose content is usually negative.

APPENDIX 2

DYADIC INTERACTION SCALE (DIS)

Instructions

You will be asked to view about 20 parent-child interactions, each of which lasts five minutes. Some of the children in these tapes are from normal, volunteer families and some of the children have been referred for treatment. In these interactions, the mother has been asked either to lead the child or to follow the child in play.

In this study we are interested in your impressions about:

How much is each person (child and mother)
leading and following?

After watching each interaction, you will be given a few minutes to answer these questions on the form provided. Before starting please read the questions on the form carefully, so you will know what to look for.

Thank you for your participation in this study.

Dyadic Interaction Scale

In each of the situations that you will see the parent has been asked to either lead the child in play or to follow the child in play. After carefully viewing their interaction please answer each of the questions below.

How much do you think the parent is following the child's play?

1	2	3	4	5
Almost None	Very Little	Some	Very Much	Almost Completely

How much do you think the child is leading the parent's play?

1	2	3	4	5
Almost None	Very Little	Some	Very Much	Almost Completely

How much do you think the child is following the parent's play?

1	2	3	4	5
Almost None	Very Little	Some	Very Much	Almost Completely

How much do you think the parent is leading the child's play?

1	2	3	4	5
Almost None	Very Little	Some	Very Much	Almost Completely

APPENDIX 3

TIME-SERIES PROGRAMS

```

;;
;;  MWPREW : Macro to use AR filters to prewhiten and align
;;           two univariate series.
;;
;;  INPUT:  ex, ey, n (the two residual series and their
length),
;;
;;  OUTPUT: wx,wy,nn (the resulting series and their length)
;;
;start
maxp=60                ; assume maxp = 60 for Wruble data
wx=SUBMNS(ex,n,1,xbar) ; subtract means
wy=SUBMNS(ey,n,1,ybar)
alphax=DTAR(wx,n,maxp,2,2,1,px,rx0,rvarx) ; fit AR processes
alphay=DTAR(wy,n,maxp,2,2,1,py,ry0,rvary)
LIST(px,py,rx0,ry0,rvarx,rvary) ; px=x order, py=y order
;
;
IF(px.gt.0)            ; find residuals
  wx=FILT(wx,alphax,1,n,px)
ENDIF
IF(py.gt.0)
  wy=FILT(wy,alphay,1,n,py)
ENDIF
nx=n-px                ; align the residuals
ny=n-py
nn=nx                  ; nn will become the common length of
residuals
IF(nx.eq.ny,end)       ; if same length, we're finished
IF(nx.gt.ny)           ; handle case where x residuals longer
  nn=ny                ; (delete first part of x residuals)
  n1=nx-ny
  n1=n1+1
  wx=EXTRACT(wx,n1,nx)
ENDIF
IF(nx.lt.ny)           ; handle case where y residuals longer
  nn=nx                ; (delete first part of y residuals)
  n1=ny-nx
  n1=n1+1
  wy=EXTRACT(wy,n1,ny)
ENDIF
;

```

```

IF(nx.lt.ny)      ;handle case where y residuals longer
  nn=nx           ;(delete first part of y residuals)
  n1=ny-nx
  n1=n1+1
  wy=EXTRACT(wy,n1,ny)
ENDIF
;
;end
;
; sevp
"
;; Show effect of adding parms on fits
;; First use mwprew to prewhiten the two input series x and y to
;; produce the prewhitened series wx and wy
"
batchon
ploton
plotsize(7)
plot(x)
plotsize(8)
plot(y)
pause
batchoff
plotoff
m1=line(n,1,0)      ; intercept terms
m2=line(n,0,1)      ; simple linear terms
md=<m1,m2>           ; simple linear model
reg(x,md,n,2,beta,rss,t,ex)
list(beta)
label(ex)='Detrended child series'
reg(y,md,n,2,beta,rss,t,ey)
list(beta)
label(ey)='Detrended mother series'
pause
batchon
ploton
plotsize(7)
plot(ex)
plotsize(8)
plot(ey)
pause
batchoff
plotoff

```

```

macro(mwprew)
label(wx)='Prewhitened Child series'
label(wy)='Prewhitened Mother series'
batchon
ploton
plotsize(7)
plot(wx)
plotsize(8)
plot(wy)
pause
batchoff
plotoff
maxp=60          ; fix maximum lag at 60
maxk=6           ; we will try 6 different lag maxima
corr2(wx,wy,nn,maxp,1,r10,r20,rho120,rho1,rho2,rho12,rho21)
chis=<11.07,18.31,25.00,31.41,37.65,43.77,49.80>
chis=<chis,55.76,61.65,67.51,73.72,79.08>
lags=<5,10,15,20,25,30,35,40,45,50,55,60>
chim=line(maxk,0,1)
label(chim)='Chi2: mother dep. on previous child';
chic=line(maxk,0,1)
label(chic)='Chi2: child dep. on previous mother';
xx=line(maxk,0,1)
label(xx)='SSE Child on previous child'
xy=line(maxk,0,1)
label(xy)='SSE Child on previous Mother'
yy=line(maxk,0,1)
label(yy)='SSE Mother on previous mother'
yx=line(maxk,0,1)
label(yx)='SSE Mother on previous child'
k=1
p=5*k
;fit
alphax=dtar(wx,nn,p,1,2,1,m,r0,rvar)
xx[k]=rvar
alphay=dtar(wy,nn,p,1,2,1,m,r0,rvar)
yy[k]=rvar
a=corrar2(r10,r20,rho120,rho1,rho2,rho12,rho21,p,sigma,ier)
xy[k]=sigma[1]
yx[k]=sigma[4]
lxx=xx[k]
lxx=loge(lxx)
lxy=xy[k]

```

```

lxy=loge(lxy)
lyy=yy[k]
lyy=loge(lyy)
lyx=yx[k]
lyx=loge(lyx)
chim[k]=nn*{lxx-lxy}
chic[k]=nn*{lyy-lyx}
k=k+1
p=5*k
if (k.le.maxk,fit)
list(xx)
list(xy)
list(yy)
list(yx)
pause
;plot sse stats
batchon
ploton
PLOTSIZE(1)
PLOT(xx,maxk,0.15,0.3)
plotsize(3)
plot(xy,maxk,0.15,0.3)
plotsize(2)
plot(yy,maxk,0.15,0.3)
plotsize(4)
plot(yx,maxk,0.15,0.3)
batchoff
pause
plotoff
list(chic)
list(chim)
pause
; plot chi-square stats
batchon
ploton
plotsize(7)
plot2(chic,chis,maxk,maxk,2,1,lags)
plotsize(8)
plot2(chim,chis,maxk,maxk,2,1,lags)
pause
batchoff
plotsize(0)
plotoff

```

APPENDIX 4

CHI-SQUARE VALUES FOR THE FIRST THREE
LAG INTERVALS OF THE CHILDREN'S DATA

DYAD	GROUP	TIME	SITUATION	CHI-SQUARE VALUES LAG INTERVAL		
				1	2	3
1	1	1	CDI	06.3	11.4	25.0
1	1	1	PDI	06.0	06.0	09.0
1	1	2	CDI	02.8	03.3	05.6
1	1	2	PDI	06.1	06.2	09.7
2	1	1	CDI	11.6	16.0	19.2
2	1	1	PDI	07.0	12.0	16.8
2	1	2	CDI	05.3	13.7	15.4
2	1	2	PDI	04.4	09.4	12.4
3	1	1	CDI	22.2	30.0	37.5
3	1	1	PDI	22.8	25.4	29.9
3	1	2	CDI	08.5	12.9	21.4
3	1	2	PDI	02.2	11.3	13.4
4	1	1	CDI	09.9	10.2	20.6
4	1	1	PDI	11.1	20.7	24.6
4	1	2	CDI	09.0	15.3	21.7
4	1	2	PDI	05.5	11.3	13.3
5	1	1	CDI	18.1	25.2	28.2
5	1	1	PDI	04.8	12.5	12.2
5	1	2	CDI	01.7	06.8	14.3
5	1	2	PDI	01.7	03.1	06.7
6	1	1	CDI	16.0	18.7	27.2
6	1	1	PDI	12.8	19.7	22.2
6	1	2	CDI	02.5	07.3	14.0
6	1	2	PDI	08.9	13.6	21.7
7	1	1	CDI	11.1	14.7	22.6
7	1	1	PDI	08.9	14.7	23.2
7	1	2	CDI	04.0	19.2	20.8
7	1	2	PDI	06.5	16.6	23.2
8	1	1	CDI	09.1	19.6	20.2
8	1	1	PDI	12.5	20.4	27.0
8	1	2	CDI	02.8	04.8	08.6
8	1	2	PDI	02.4	11.4	15.9
9	1	1	CDI	07.3	09.7	14.4
9	1	1	PDI	07.0	17.3	20.7
9	1	2	CDI	06.1	10.2	17.1
9	1	2	PDI	11.6	27.5	30.1
10	1	1	CDI	05.0	12.7	22.5

10	1	1	PDI	05.0	07.3	11.0
10	1	2	CDI	03.3	09.2	14.8
10	1	2	PDI	02.9	08.0	13.1
11	1	1	CDI	03.7	12.7	20.9
11	1	1	PDI	04.3	11.9	21.3
11	1	2	CDI	12.3	17.3	19.7
11	1	2	PDI	09.9	19.0	23.5
12	1	1	CDI	10.8	16.2	22.6
12	1	1	PDI	04.3	04.6	08.6
12	1	2	CDI	05.6	08.7	10.0
12	1	2	PDI	05.7	12.5	15.9
13	2	1	CDI	11.9	13.6	14.8
13	2	1	PDI	09.0	13.5	25.3
13	2	2	CDI	16.1	15.9	23.0
13	2	2	PDI	04.7	08.8	09.3
14	2	1	CDI	09.3	10.8	14.2
14	2	1	PDI	18.0	19.5	29.8
14	2	2	CDI	08.1	14.0	20.1
14	2	2	PDI	01.8	04.2	15.0
15	2	1	CDI	07.2	09.9	17.4
15	2	1	PDI	06.8	10.8	13.5
15	2	2	CDI	16.7	26.2	33.4
15	2	2	PDI	06.7	08.3	18.4
16	2	1	CDI	03.1	04.0	06.5
16	2	1	PDI	12.7	16.5	18.6
16	2	2	CDI	07.3	09.8	13.8
16	2	2	PDI	02.8	14.7	18.1
17	2	1	CDI	08.2	13.5	17.7
17	2	1	PDI	12.4	21.2	22.7
17	2	2	CDI	11.8	14.7	27.6
17	2	2	PDI	06.9	11.6	19.3
18	2	1	CDI	21.4	28.0	33.9
18	2	1	PDI	11.6	15.4	20.2
18	2	2	CDI	07.5	21.8	28.4
18	2	2	PDI	09.6	18.3	23.3
19	2	1	CDI	11.7	14.7	19.8
19	2	1	PDI	09.5	24.0	29.3
19	2	2	CDI	02.1	04.6	08.2
19	2	2	PDI	02.1	18.8	27.0
20	2	1	CDI	04.2	07.6	20.4
20	2	1	PDI	09.2	17.0	21.2
20	2	2	CDI	09.4	11.2	16.9
20	2	2	PDI	11.5	17.8	25.9
21	2	1	CDI	05.2	10.1	15.3
21	2	1	PDI	07.5	15.0	21.3
21	2	2	CDI	01.6	07.2	13.9
21	2	2	PDI	09.5	11.9	23.0
22	2	1	CDI	04.7	10.5	15.9
22	2	1	PDI	05.3	08.3	11.8
22	2	2	CDI	04.6	07.6	11.0
22	2	2	PDI	08.2	15.3	16.9
23	2	1	CDI	12.2	15.0	17.4
23	2	1	PDI	12.4	15.2	18.9
23	2	2	CDI	05.7	06.0	10.1

23	2	2	PDI	10.6	11.5	12.3
24	2	1	CDI	01.9	05.7	12.6
24	2	1	PDI	07.5	09.6	14.8
24	2	2	CDI	06.7	08.4	13.6
24	2	2	PDI	09.5	12.6	13.4

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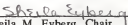
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BIOGRAPHICAL SKETCH

Marc K. Wruble was born in Detroit, Michigan, on October 13, 1962. He spent the first nine years of his life with the foster family of Sigmund and Phyllis Gretzner. It was here that Marc developed interests in helping others, teaching, and athletics; interests that continue to this day. At the age of nine, Marc was united with his mother, Joan, and sister, Karen. Living in two families helped Marc appreciate the importance of family and friends in meeting the challenges that come with growth and change. In 1980, Marc graduated from Harry S. Truman High School in Taylor, Michigan, where his interest in teaching and psychology was reinforced by his psychology instructor, Mr. Bill Bowman. In 1985, Marc graduated from Eastern Michigan University where he met his wife, Dee, and where he was introduced to systems theory by his venerable mentor, Dr. Dennis Delprato. Throughout his graduate education, Marc's interests in systems theory and methodology were advanced by the pioneering research and thinking of Dr. Roger Ray. In December of 1991, Marc graduated from the University of Florida with a Doctorate in Clinical Psychology and a specialization in Child and Family Clinical Psychology. At the University of Florida, Marc's professional interests in

children and families were sharpened and advanced by his mentor, Dr. Sheila Eyberg. Marc's personal and clinical development was enhanced by his fellow interns and supervisors during a one-year clinical internship at the University of Medicine and Dentistry of New Jersey. Marc is the first member of either of his extended families to receive a doctoral degree, but he is the first to acknowledge that support from his friends and family contributed greatly to this accomplishment. Marc hopes to continue finding ways to understand children and families better so as to help them establish the healthy family traditions that perpetuate happier and more fulfilling lives.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



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This dissertation was submitted to the Graduate Faculty of the College of Health Related Professions and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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